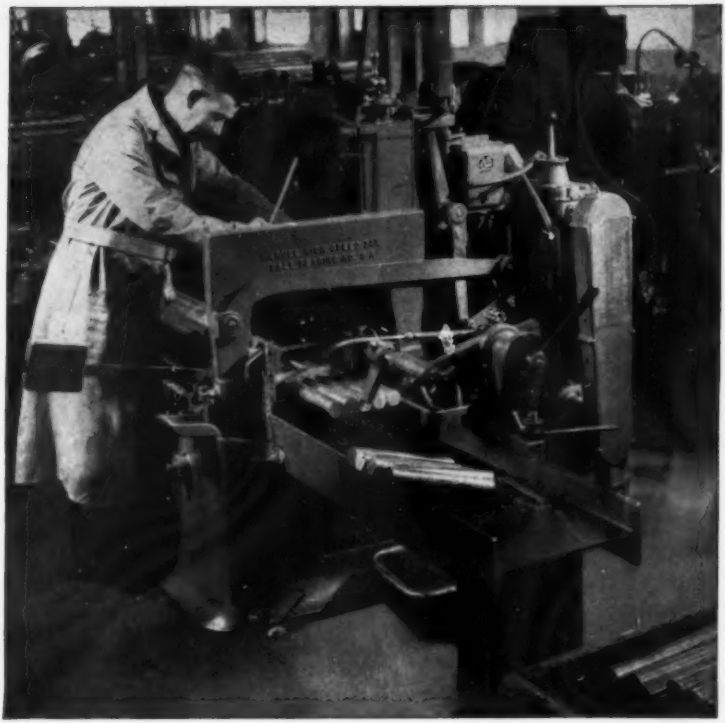
MACHINE TOOL

Blue Book

JULY 1941

FRAY ALL ANGLE

FRAY MACHINE TOOL COMPANY
Glendale, California, U. S. A.



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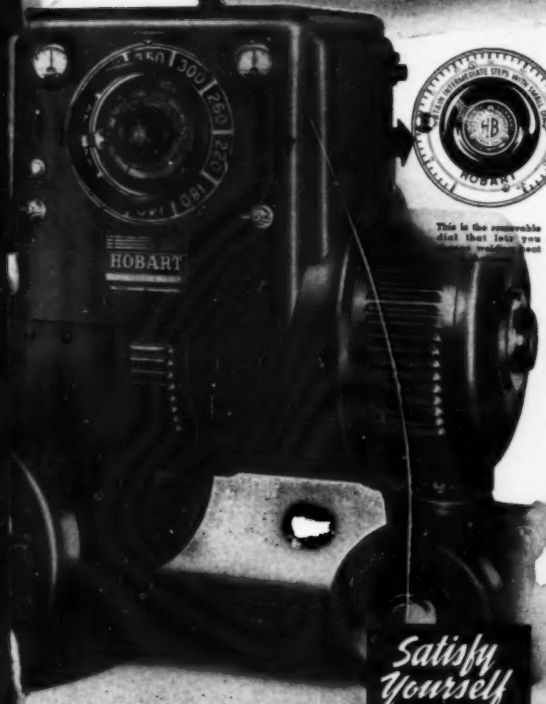

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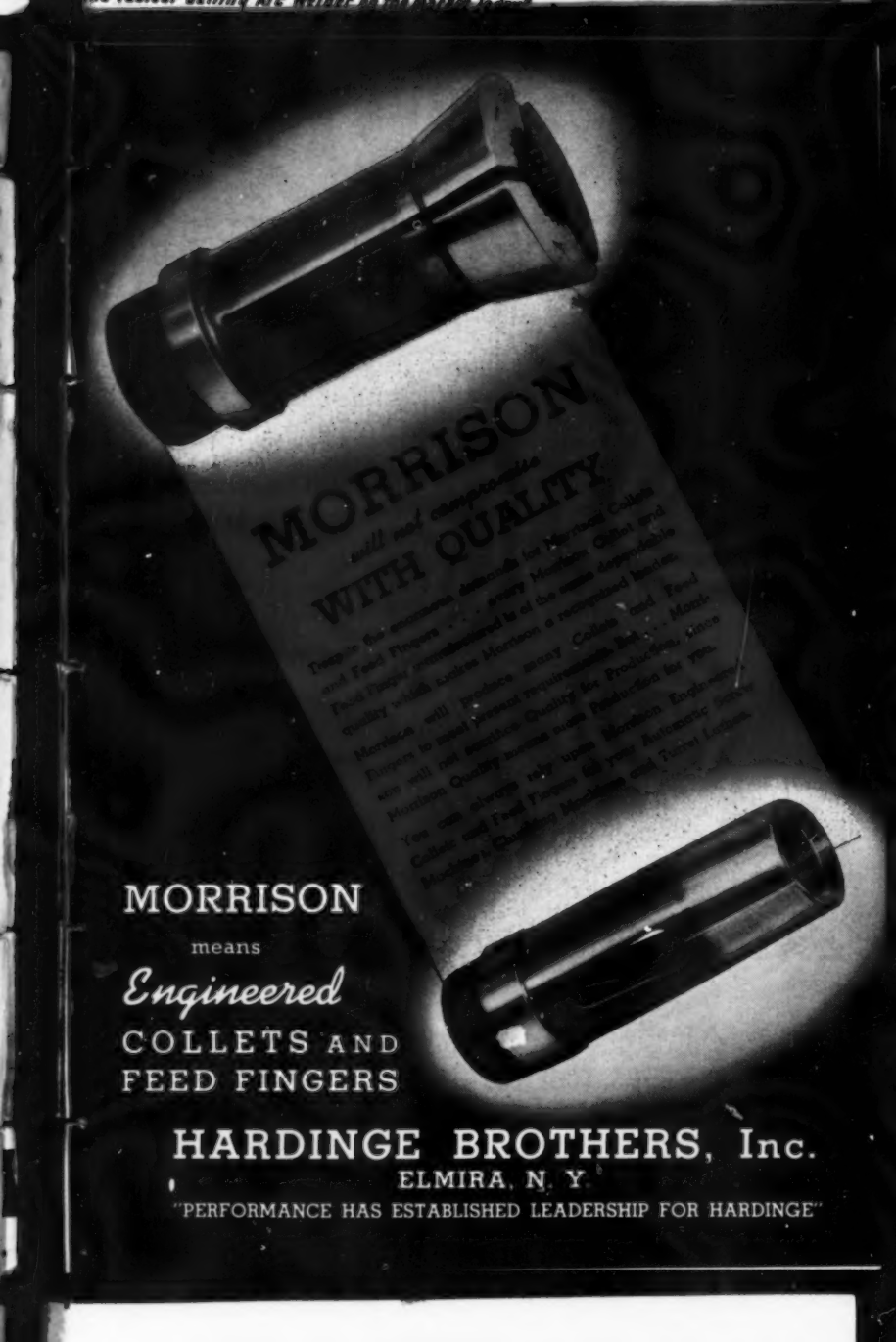
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MACHINE TOOL BLUE BOOK

Hitchcock Publishing Co., 508 So. Dearborn St., Chicago

35,000 THIS ISSUE *JULY 1941* *VOLUME 37, No. 7*

CCA

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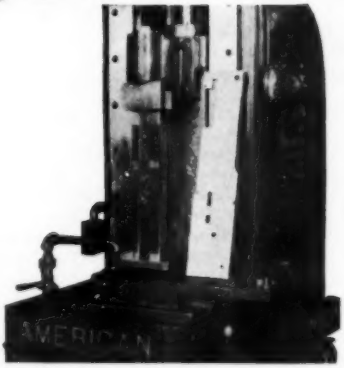
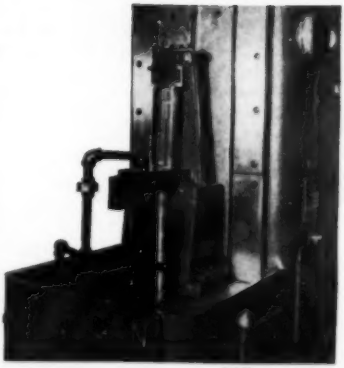
Broaching •• MACHINE GUN PARTS FOR DEFENSE



Shown in the cuts to the right are two of a dozen machines which facilitate 16 broaching set-ups for machine gun parts.

Parts on which broaching operations are successfully carried out are the bottom plate, oil buffer spring guide, side plate, latch cover, firing pin extension and cover.

Shown in cut above right is close up of push down arrangement on an AMERICAN T-4-24 machine for broaching 180 side plates per hour. Lower right is shown pull down broaching of cover plates at the rate of 40 complete per hour using a set of seven broaches.



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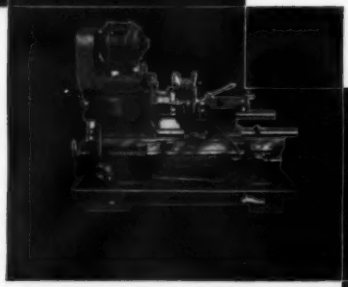

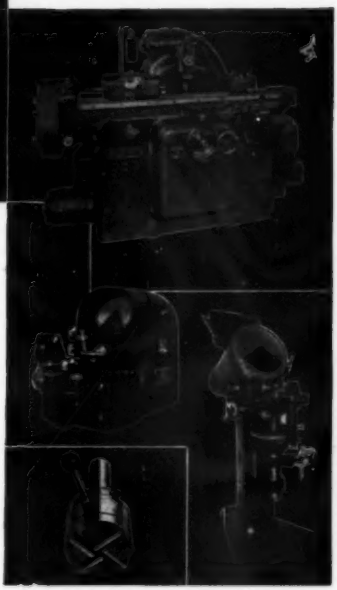

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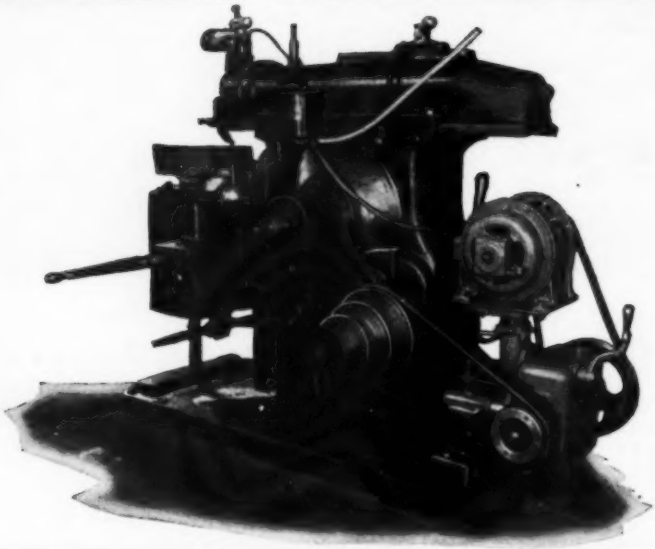

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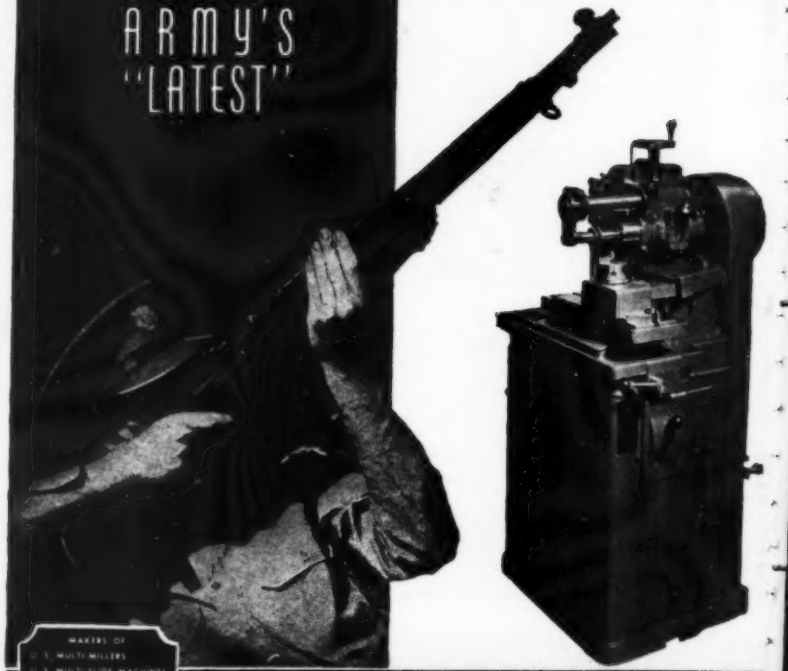

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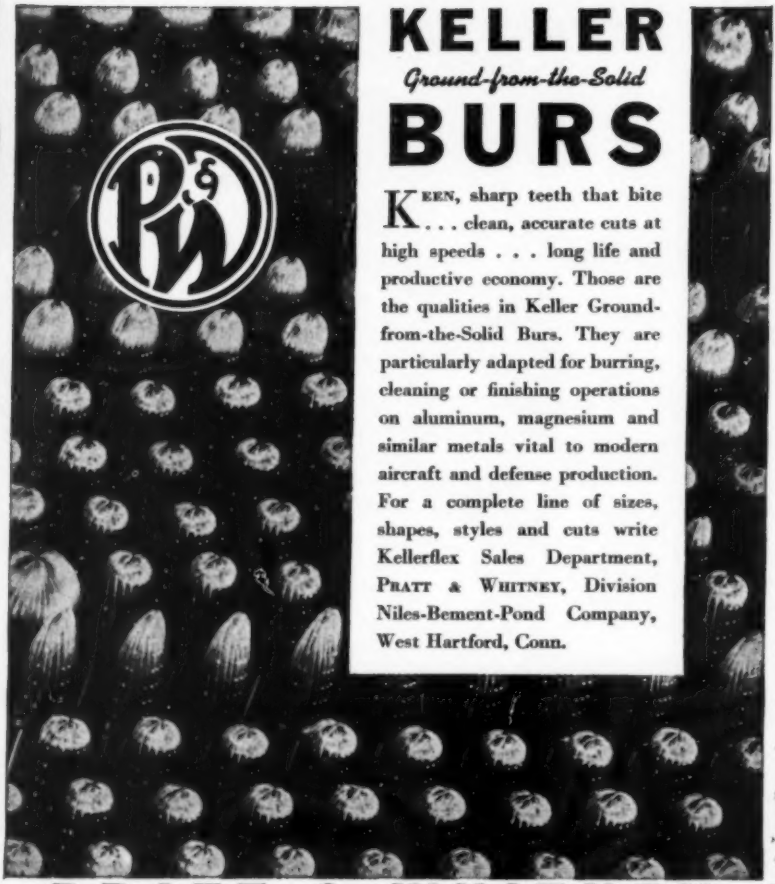

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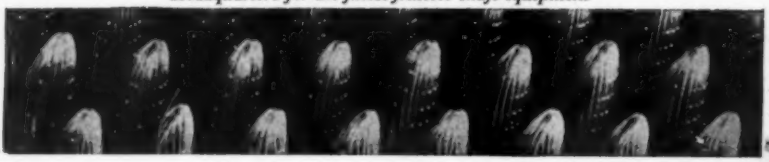

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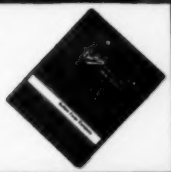

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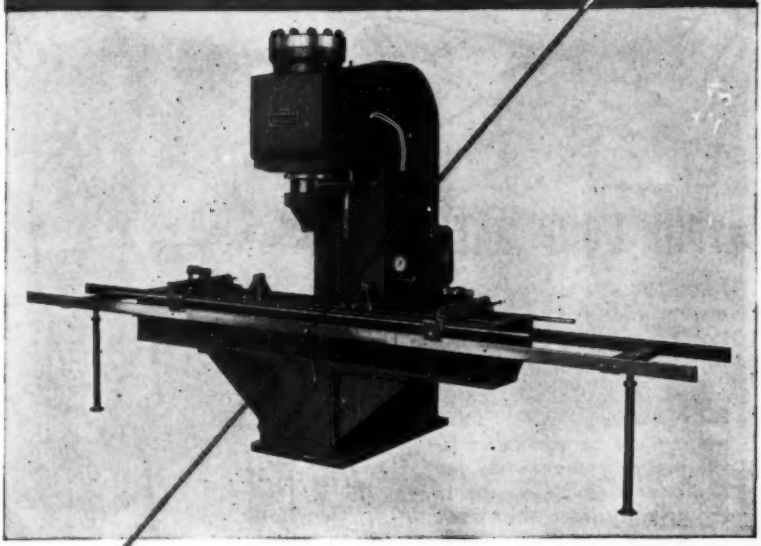

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Boring Tool—3 Sizes

Adjustment actuated by worm. Can be used as Radius Tool.

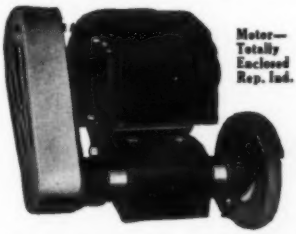
Maxwell Recessing Tool

Grooving, Recessing, Back Facing
4 Sizes 1", 2", 3", 4"
OPERATION is almost INSTANTANEOUS

MASTUR
Precision Boring Head—3 Sizes

Direct reading in thousandths. Veneer reading two tenths.

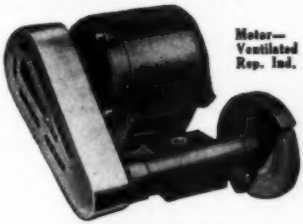
TYPE HE ½ H. P.



Motor—Totally Enclosed Rep. Ind.

Internal or External. Internal Spindles up to 24" long.

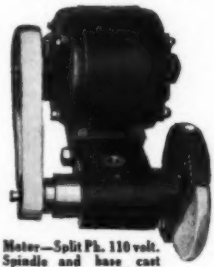
TYPE EX ½ H. P.



Motor—Ventilated Rep. Ind.

For External Grinding. Spindle and Base Cast Solid.

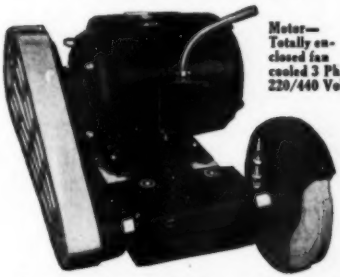
TYPE N ¼ and C ⅓ H. P.



Motor—Split Ph. 110 volt. Spindle and base cast solid. A general Utility Grinder.

Send for individual descriptive circular.

TYPE D 1-2-3 H. P.



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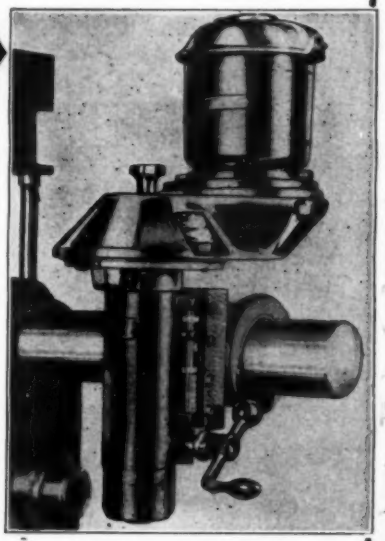

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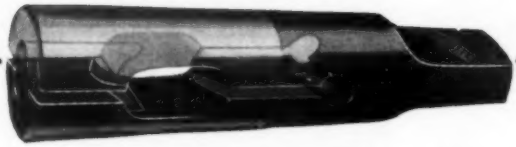

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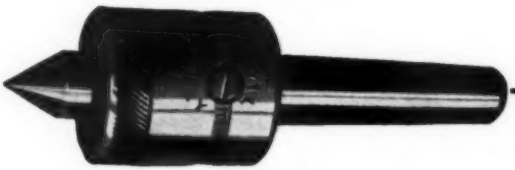

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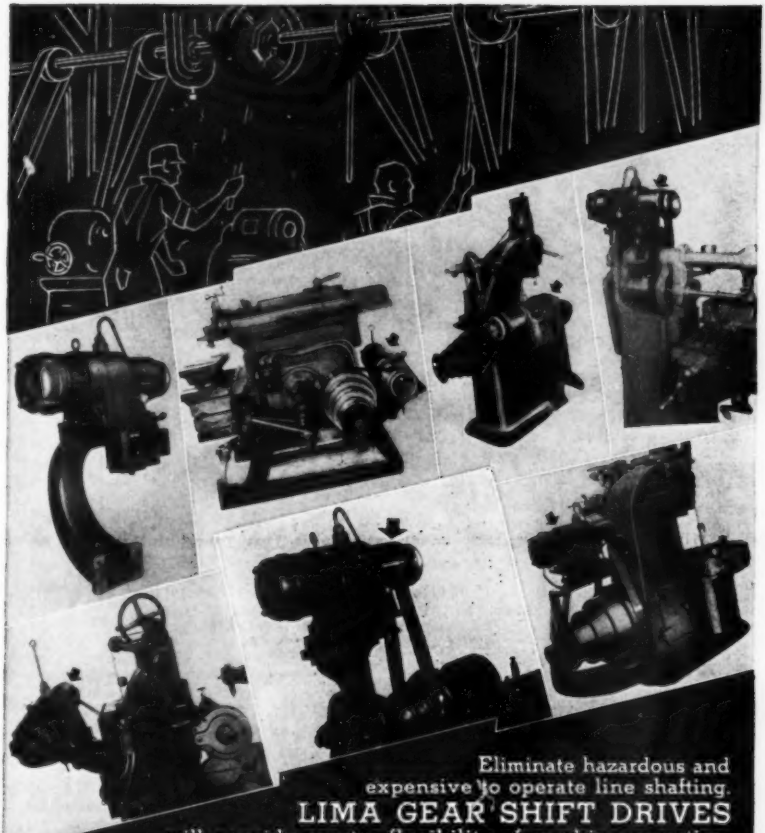

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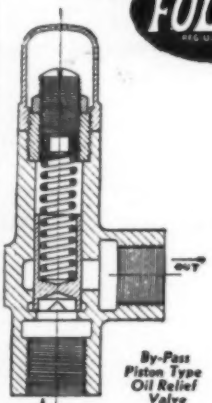

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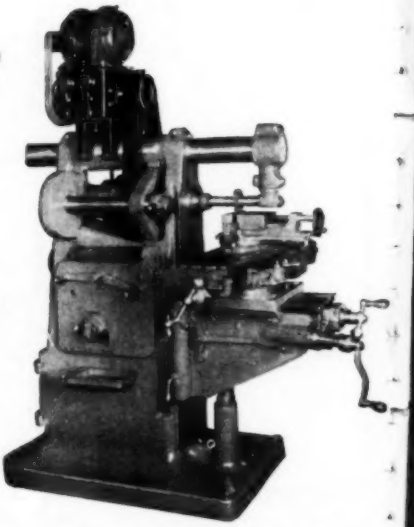

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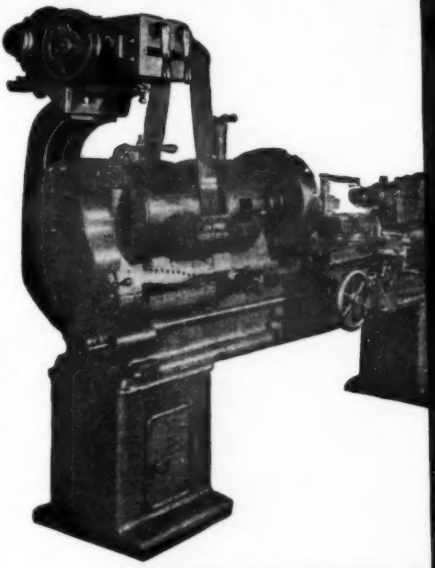

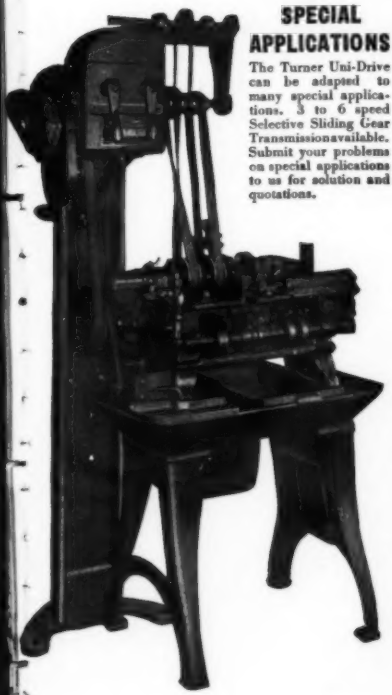

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Featured In This Issue

MODERN APPRENTICE TRAINING—Many apprentice training programs are effective in developing mechanical skill—but Kearney & Trecker's plan is unique in several respects. It is a long range program which helps to develop potential shop executives. M. G. Heuer takes us behind the scenes and explains just how it works....page 39

GRINDING RELIEFS—Closer cooperation between the lathe and the grinding departments is the direct object of this timely contribution by H. F. Williams. Standard forms and sizes are recommended for the various types and sizes of grinding reliefs on shouldered work, adoption of which will improve the products, save time and confusion. See page 53

DEVELOPMENT OF MODERN PLANER DRIVES — The machining tempo of most machine tools has been stepped-up materially of late — and Planers have kept in step with progress. Ray D. Allison of Cincinnati Planer Co., traces the modernization of Planer Drives. See page.....61

DYNAMIC BALANCING—In a previous article in The Blue Book, Werner I. Senger, Chief Development Engineer, The Gisholt Co., explained the importance of Dynamic Balance in high speed rotating parts, describing a precision method of attaining such balance. In this contribution, Mr. Senger covers a specific application of the balancing procedure in the case of automotive crankshafts. Page 73

STEEL-CUTTING WITH CARBIDES—The important contributions of Carbide Tools in meeting the present emergency are explained by Philip M. McKenna, President, McKenna Metals Co., with recommendations on tool designs, specific jobs, etc. The article is based on a discussion of the subject at the Westinghouse Motorization Forum. See page 87

SERVICING TOOLS AND SHOP METHODS — The importance of care and precision in the tightening of studs and nuts—and the method of accomplishing this are stressed by A. Brunelle, Service Tool Engineer, Wright Aeronautical Corp., on page.....99

"IF I WERE 21"—By Wm. S. Knudsen stresses the desirability of learning manual skill in modern shops as contrasted with "white collar" jobs. See page 110

RECENT WELDING AND CUTTING DEVELOPMENTS—Francis A. Westbrook, M. E., explains the importance of modern Welding and Cutting developments in defense activities. Page..113

WHAT'S NEW IN PLASTICS—Presents some of the latest developments in this fast-moving field on page....123

HARDENING CYLINDER LINERS—Describes a new method of treating automotive cylinder liners for increased life. Page 141

BROACHING CARBURETOR BODIES—Stepping-up Carburetor production with assurance of a higher degree of accuracy. Page 151

CLEANING SHELLS—A new method of removing scale and preparing shells for machining, preventing unnecessary wear and tear on carbide tools is described on page 155

SPEEDING PRODUCTION OF PROPELLER PARTS—Speedy turret lathe production of propeller hubs is described on page 159

LET'S TALK SHOP—A quick method of belt shifting on a bench drill and some interesting machining operations are presented in this helpful section, starting on page 167

WHAT'S NEW IN THE INDUSTRY—Clear and concise descriptions and pictures of the latest tools are included in this section, beginning on page 177.

"SEVENS" DEALS A WINNER—In a popular vein, S. H. Mellor of Porter-Cable Co., tells how a production bottle-neck was broken by modern Belt Grinding. See Page 195

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This is the new 10″ swing 1″ collet capacity South Bend Underneath Belt Motor Driven Precision Tool Room Bench Lathe. South Bend Lathes are made in five sizes: 9″, 10″, 13″, 14½″, and 16″ swing, with various types of drives.

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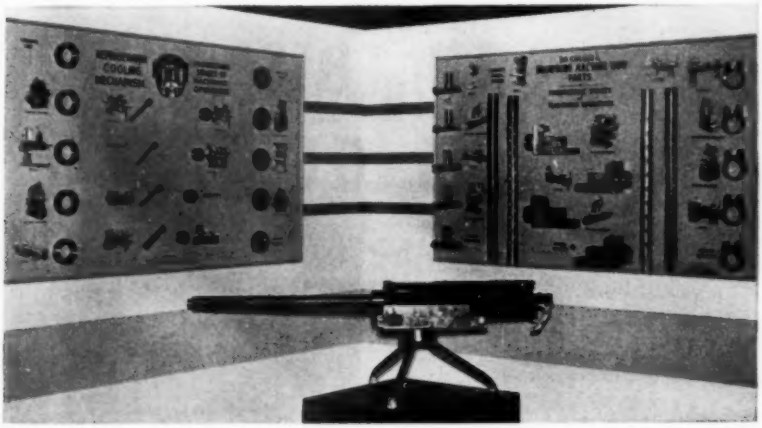
Editor's Page



DEFENSE preparations, so far, have centered around machine tools—and the tool manufacturers have responded with vim and vigor, exceeding their own production expectations time and again.

In the uncertain days ahead, tooling needs will continue to expand greatly, but if all branches of our defense activities follow the lead of the machine tool builders, there will be less apprehension.

Recently, a defense exhibition was held in Cincinnati, in which nearby machine tool manufacturers participated. Products, rather than tools themselves were stressed, emphasizing the relationship in origin of many of the peace time and defense products made by the five basic machine operations. Therein lies hope for the future, after the emergency has passed—many of the machine tools are versatile and may be converted readily for peace time production. More and more, domestic production will be restricted, building up potential needs that should help to cushion the transition period.

Wesley G. Paulson

THREE WAYS TO WORK ON THIS PROBLEM OF *STEEL*

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Modern Apprentice Training

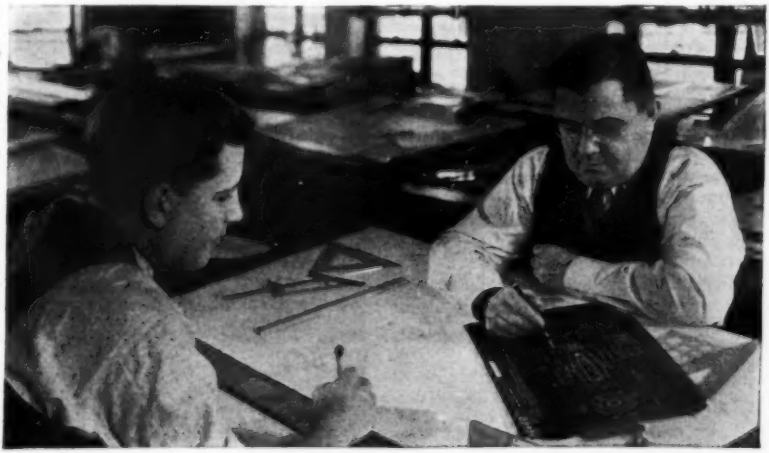
By M. G. HEUER

So much thought is being given to the need for high speed production that men are being turned loose on special jobs without the all-round training that used to be required. Apprenticeship is being threatened, but alert job trainers are more than ever mindful of the fact that in the long run industry must have fully trained mechanics.

Both the challenge of high speed production and adequate training are being met in a unique apprentice-training program at the Kearney & Trecker Co., Milwaukee, where 3300 workers are busy on milling machines and subcontracts for national defense.

Introduced five years ago, the training program maintains a 10 to one percentage basis, and a production about 10 per cent over the standard rates for apprentices. It runs so smoothly that when the number of apprentices was increased from 80 to 160 in 1940, production average was not curtailed at all.

Its interest to workers is proved by the fact that in the five years of its



Training in draftsmanship and engineering principles is an important part of any comprehensive program.

Theoretical knowledge is supplemented by actual experience. This novice is learning the fundamentals of inspection by actual participation under expert supervision.

use, only one apprentice has been lost to the company.

"Years ago," said Mr. George Havlista, director of industrial training at Kearney and Trecker, "we used to dump one or two boys into a department to sink or swim. Often they spent most of their time doing flunkie jobs like sweeping and cleaning. Our present system enables us to place as many as six apprentices in one department, and to have positive assurance at all times that each apprentice is making definite progress on his job."

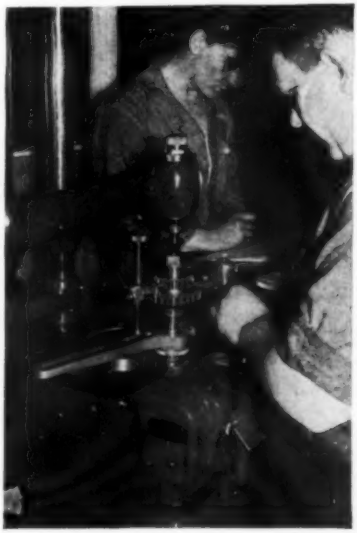
Teamwork of apprentices is so well integrated that it develops executives and key men rather than run of the mill shop workers. Many become assistant managers, shop superintendents, foremen, assistant foremen, service workers, and sales representatives soon after their period of apprenticeship is over.

Shortening the cycle of training in each department and repeating each cycle at a later date have made these training teams even more effective in the rush demands of defense orders.

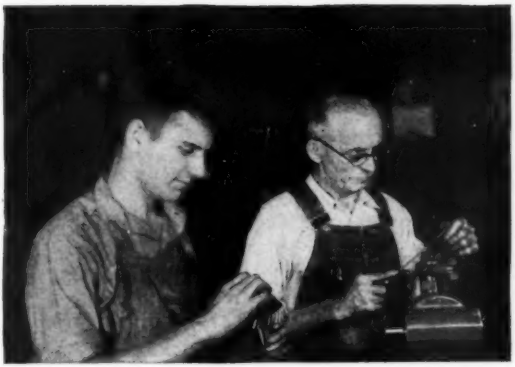
"We're finding," says Training Director Havlista, "that repetitive training at a later date is better than intensive training all at once in developing workers as well as for doing faster work."

But first, where do all these trainees come from?

"We trade with all the vocational schools and high schools in Milwaukee and surrounding towns, even going as



The apprentice must learn coordination of eye, mind and muscles.



The older hands take pride in making their skill and experience available.

far as Minneapolis," says Mr. Havlista. "For the last year and a half we haven't seen the boys at all before they were actually hired. We take them on just on the strength of their photographs and the results they've made on our aptitude tests."

Those tests check aptitude for shop work so carefully that few apprentices wind up as "square pegs in round holes." They're not questions meant to trick applicants, but simple problems to reveal what the boys remember from grammar school arithmetic, how keenly they observe, how handy they are with their hands. One method that has been found effective for checking powers of observation, for instance, is to time applicants on a simple test involving the conversion of fractions of a circle into degrees, or vice versa. Another test deals with micrometer scale reading.

Tests are both written and oral, and are given by shop-training teachers at vocational school or high school. So far the company has been able to require that applicants be high school graduates, between the ages of 18 to 22.

Highest rating on the tests is 3,000 points. In normal times about 10 per cent of the tested applicants are considered of real value as apprentices. Today the company is hiring at 2500 points.

"Six months from now we may go down to 2,000 points, a year from now to 1,000 points," commented Director Havlista. "At any rate, we're getting the cream of what is now available."

When the boys are ready to come into the shop, they meet the training director in the shop auditorium for a three-hour talk on the complete set-up of the shop, illustrated with moving pictures and slides. They're given a clear picture of just what kind of training they will receive. Each boy signs the regular indenture forms established by the Industrial Commission of Wisconsin. The forms stipulate that the term of apprenticeship is 8,320 hours of employment on 40 hours per week and 52 weeks per year. The apprentice learns that he will spend one day a week at the Milwaukee vocational school for a minimum total of 576 hours, which is counted as part of the hours of labor.

Then each apprentice is sent to the department to which he has been assigned and starts immediately on his regular training on the actual production line. This is done on the theory that there's no better way to learn

skills than right on the machines.

All apprentices in the shop work in groups. A group may contain three, four; five, or six apprentices, and each group has one all-around apprentice who is responsible for the quality of work and the production of the apprentices in his group. The boys respond to that kind of responsibility by developing and showing executive talent in the early stages of their work.

In a group of six, for instance, four apprentices are assigned to each of four machines. When an apprentice begins his training he takes the first machine in the group and keeps that position four weeks. For his second four-week period he steps up to Machine No. 2, and on up. After he has had 16 weeks of experience, four weeks on each of the machines in his set-up, he takes the fifth position of fill-in man, taking the place of each apprentice in his group on the day he goes to vocational school. Finally he takes the position of utility man in charge of the quality and quantity of the work done by his group.

Developing Responsibility

Every four weeks a brand new boy comes in at the bottom of the line in a six-man team. The utility man also takes the responsibility of guiding the young apprentice in his work.

"That last four weeks on the team," says the training director, "makes a new person out of the young apprentice. When he gets down to business and shows a new boy how to get jobs, he gets over his own inferiority complexes and begins thinking of the job at hand."

Another thing that the utility apprentice learns is valuable training for future foremanship jobs:—He must see that the other apprentices are furnished with jobs. He must have a job prepared for each apprentice to start on as soon as the present job is completed.

"That," commented Mr. Havlista, "is always one of the hardest things for any foreman to do. Many experienced foremen let a worker stand around for a while before a job is ready, and all the money for that time is lost to the company."

Apprentices don't catch on to the right way of handling men at once, of course, and here's where guidance helps to round them out so they can handle men tactfully on regular jobs later. One boy, for instance, who had started five months ago, was entering his sixth period on a team. Just as the training director happened by on his morning rounds, he overheard the utility apprentice saying to one of the boys on a machine:

"You can't hold that job that way. You'll get that casting all out of shape."

The utility apprentice stalked away from the young trainee after using such "Bull of the Woods" methods. It was the training director's chance for a quiet little chat with the utility man, telling him how he might have explained more tactfully to the younger worker how to prevent the springing of the casting.

"We usually take a trip around the plant every morning," says Mr. Havlista. "We don't, however, have to check up on each apprentice. All we have to do is to check on the lead man in each group. We make a point of talking with each of the 40 lead men, asking how their little gangs are getting along, and making observations of our own."

Each apprentice must submit weekly reports of the job he has handled during that week, including free hand sketching or drawings of some of the parts he had handled. This is all home work to give the boys a chance to show their ability at sketching and mechanical drawing. Two girls in the training director's office are kept busy full time going over these papers. Tardiness in turning papers in is heavily censured.

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A projector and an ample supply of slides and films is a real aid in imparting instruction. Director Havlista is shown at the right in the background.

since the department feels that promptness in turning in reports is one of the most valuable things a boy can learn. As proof of the value of such strictness, no apprentice graduate sent out on sales or management jobs later has ever been criticized for turning in tardy reports.

Monthly reports are also handed in by each apprentice, showing hours of work per day and what kind of work was accomplished. This gives the training director a check on whether the youngster was doing sweeping and clean-up work most of the time, or whether he was getting a chance to make definite progress in his trade.

The utility man responsible for each apprentice group is also asked to turn in special suggestions which he feels might be of help in improving efficiency or attitudes in a department. These suggestions are often put into practice, and help groups to move along without constant supervision. If, for instance, a foreman does use an apprentice for flunkie work to a point that is not fair to the boy's progress, these reports from the utility man can call the grievance to the attention of management so the situation may be rectified quickly.

"I could really sit in my office all day," Mr. Havlista pointed out, "and my gangs would run on their own steam. In other words, our apprentices are minor executives."

Special stress is laid on helping apprentices learn how to get along with their fellow-workers and foremen—all on the theory that the most exact

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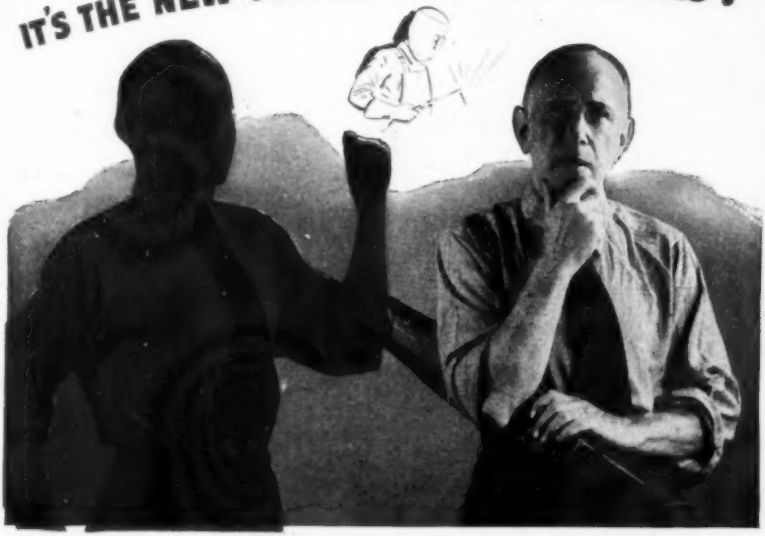

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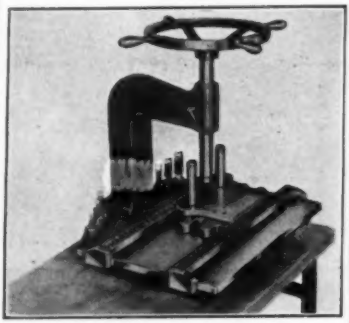

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knowledge of a trade is of little value to a man if he can't get along with his co-workers.

Changes from one department to another are announced a week in advance of changing periods, by means of notices on the apprentice bulletin board in the auditorium training room. Bill Daniels, for instance, might see his name posted like this:

Bill Daniels—shifted from the milling machine 1st shift to third shift.

John Steel—from 28 drill to 42 erecting.

Edward Relt—from 3 planer to 42 utility squad.

It takes about four hours, every four weeks, for the training director to assign transfers. To make that job of assigning transfers easy, apprentice cards are kept in groups, the top card showing the date when the transfer should be made. It's a system, the training director contends, that "can't go haywire" in any respect.

While apprentices share in actual production work in this way, their training is further directed in the shop class-room or auditorium. For instruction purposes here, apprentices are split up into three groups, each apprentice attending a one hour meeting a week. The last year apprentices are drilled in foremanship training, using the blackboard conference method. The other two groups have regular shop discussion. Shop problems and questions that arise in the minds of individual apprentices are brought up for discussion in these weekly get-togethers.

Visual education is utilized at these meetings to give trainees actual performance patterns to help them on their jobs. The company has a file of about 250 slides and four sets of moving pictures showing actual operations in the plant. These can be divided according to subject matter so that specific details may be brought into focus on the

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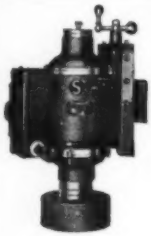

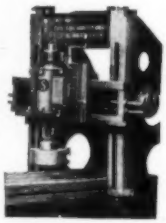

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The Standard Electrical Tool Co.
1954 W. 8th St., Cincinnati, Ohio

screen, to illustrate topics being discussed.

"We find these films and slides invaluable training aids," declares Mr. Havlista. "The boys remember a point much longer when we bring it into sharp focus on the screen and make it large. They can concentrate on the details more easily. Just as important, these visual aids are a big help to me as the training director. They make it possible for me to spend much less time in preparing instructional material for each class."

Before any apprentice is transferred out of his group to a new training group, he must write a composition on the department he is leaving, telling what he learned in that department. This gives him a chance to express himself in writing; to report what he has done himself and what he has learned by observation. Working up such a report every four weeks or so helps him to overcome all fear of making reports, develops his confidence, and brings out his executive talents still more in preparation for the key job he hopes to take after his apprentice days are over.

The master stroke in the Kearney and Trecker training program comes at the very end of a boy's apprenticeship. At the completion of his training period, each apprentice must find his own job in the plant. He must find a foreman who recognizes his special abilities and is willing to hire him. He has a chance to barter and to choose the job that gives him the best rate and the best chance to get ahead.

"That little touch of psychology," Training Director Havlista contends, "is very important. In many industries the graduate apprentice is pushed into any hole that may be open and left there to breed discontent or to grow, just as the situation may strike the individual. Our system, we believe, makes a

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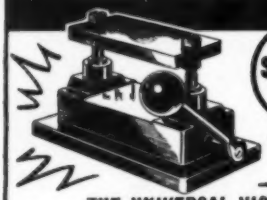

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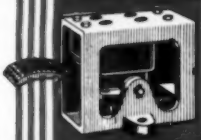

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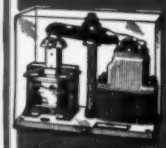

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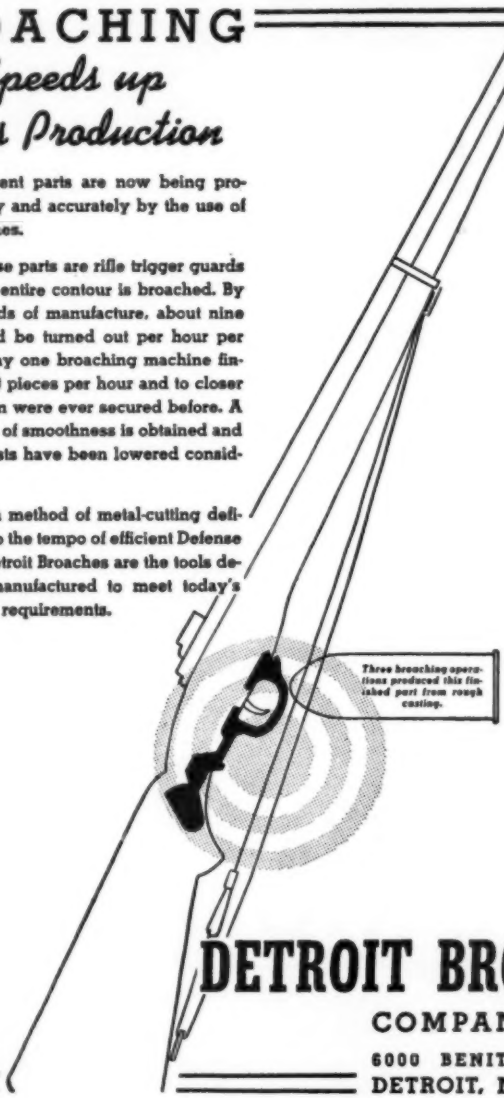

Three broaching operations produced this finished part from rough casting.

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Grinding Reliefs

By H. F. WILLIAMS

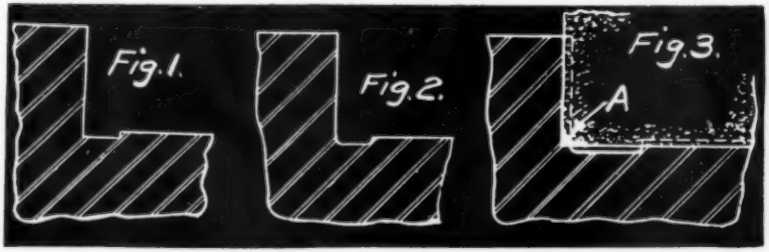
IN these days of high and accelerated production for National Defense, every effort should be made towards greater efficiency between the several departments of the machine shop. One place where this cooperation is very necessary is between the lathe and the grinding departments. It is surprising to see the various types and sizes of grinding reliefs or necks on shouldered work that emanate from the lathe department. This is due partly to the hiring and shifting of new and unskilled help, or to general disregard of common shop practice.

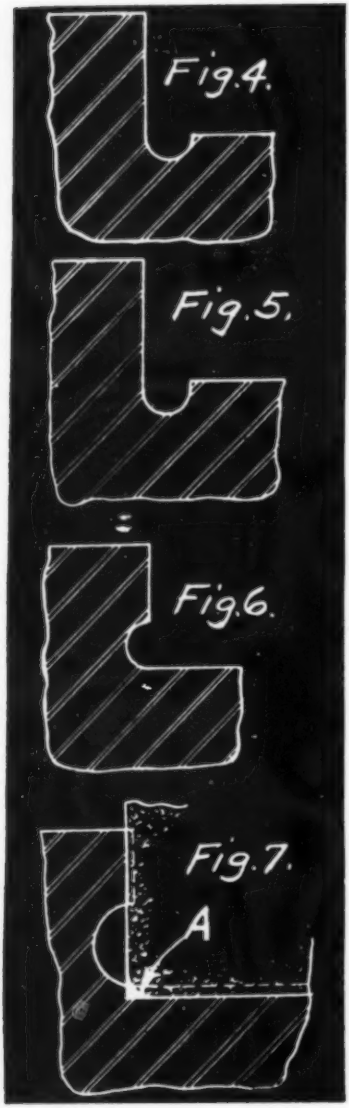
Standard forms and sizes should be adopted and rigidly followed for this seemingly insignificant, yet very important detail. Not only should it appear in the company standards book, but also should be shown on every detail drawing, especially relative to width and diameter, and in many instances, especially when both diameter and shoulder are ground.

Grinding reliefs on cylindrical spindles, arbors and all shouldered shafts in general are used primarily to produce a square corner in space, where the vertical and horizontal planes of these surfaces coincide. Were it possible for a grinding wheel to grind such a sharp corner as could be turned with a corner turning tool, grinding reliefs would be unnecessary. This, however, is not so, because the corners of both sides of the wheel break down by abrasion, leaving a rounded or beveled leading edge.

Being a necessary evil, grinding reliefs should be made as narrow and shallow as consistent with good practice requirements. The greater the edge wear of the wheel, the wider the relief should be. However, the wider the relief, the less bearing surface remains. This is of importance in the mounting of ball and roller bearings in which the percentage of relief width to bearing width is high. This question will be discussed later in this article.

Because necking reduces both cross sectional area and strength of shaft, the design of relief shape should be carefully studied. It should be borne





in mind that sharp corners on shouldered shafts, more especially those that are heat treated, produce a tendency to crack, thereby causing shaft failure. This is shown in Fig. 1. In this case, only the cylindrical part is ground, the shouldered surface being left as it comes from the lathe department.

In Fig. 2, a better design is shown in that the relief has two rounded ends. On very shallow cuts, the radius is necessarily small and is not very effective. While such a shape is intended only as that in Fig. 1, Fig. 3 shows the effect if the shoulder is also ground. The dotted lines are as the shaft comes to the grinding department. The full lines are those of the ground and completed shaft. The heavy portion shown at "A" is the metal fillet left from a rounded edge wheel. Unless this is removed, no square cornered piece can be pressed against the shaft shoulder.

A Familiar Figure

Every old-time machinist or tool maker has seen the relief shape as in Fig. 4. All that was needed was a narrow cutting off tool with a rounded cutting end. This was sunk into the shaft so that the center of the radius was on the same plane as the ground surface of the cylindrical horizontal bearing. This groove was used when the shoulder was not to be ground. When this type of groove was too shallow, it was found upon assembling the component parts, that a shoulder bearing was impossible without first turning out the corner. The happy thought then struck the machinist that the next lot of shafts was to be made as shown in Fig. 5. Here the radius of the tool point is well below the finished grinding plane. While this overcame the difficulty of assembling, it was soon found that the shaft was so weakened by such deep undercutting that it failed because of reduced strength.

To overcome the condition in Figs. 4 and 5, the grinding relief in Fig. 6

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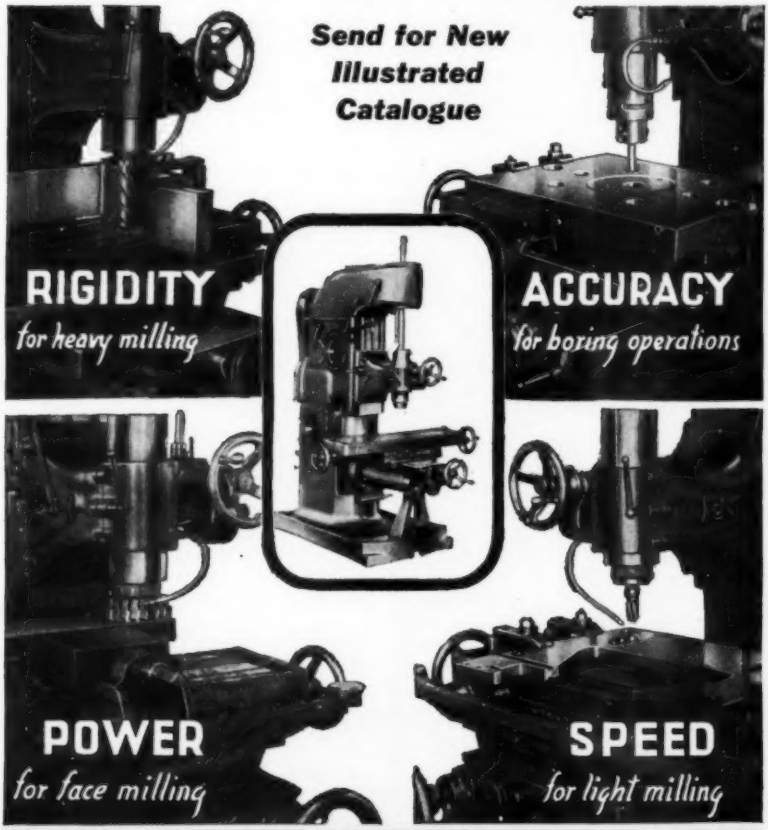

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was used. The feature of this type was that strength was not sacrificed in the body of the shaft, but rather that the entire groove was in the shoulder. In Fig. 7 you will observe the results especially where the body was ground. Dotted lines are before grinding and solid lines after grinding. At "A" is shown the amount of interference, a condition similar to that in Fig. 3.

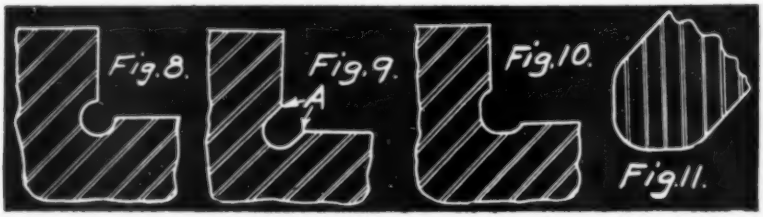
A Tough One

When a square and sharp corner is desired on a flat piece of stock, a hole is usually drilled in the solid at the axis of the two planes. The two perpendicular surfaces are then machined. In Fig. 8 is shown such a groove or relief as applied to a cylindrical part, however erroneously. This is careless drawing on the part of the draftsman and causes consternation and confusion to the new man in the lathe gang. He wonders how in heck he is going to grind a tool to make such a groove, and if so, how is he to get the tool out of the groove when finished. While the theory of shape is in the right direction, it should be completed correctly as in Fig. 9. Here the radius of the tool point is at the axis of the vertical and horizontal planes, the sides of the tool cutting out the body and shoulder as at "A-A" at 45°. Now both surfaces can be ground without leaving a fillet. For strength of shaft, however, this relief is no better than that shown in Fig. 4 and but slightly better than that in Fig. 5.

The answer to this problem of strength, therefore, seems to be one of reducing the relief depth but retaining some or all of the good points of the other designs of grooves. Such a method is shown in Fig. 10. This type has been used with great success and is known to overcome spoilage from cracked work. The tool approaches the corner at a 45° angle. It is sunk into the work so that the groove depth in the body of the shaft will be from 0.005" to 0.010" deep per side after grinding. It is then fed longitudinally into the shaft shoulder until the depth of approximately 1/32" is reached. In Fig. 11 is an enlarged view of the end of the turning tool. The radius at the three corners should be made as large as possible, and can be ascertained readily by making a layout of from 10 to 20 times scale. The radius need only clear the intersection of the vertical and horizontal planes by 0.008" or 0.010" as is shown at "A" in Fig. 12.

Standard Relief

A grinding relief or undercut as adopted by the American Standards Ass'n is shown in Fig. 13. It is applied to tapered lathe spindle noses for turret and automatic lathes, also to grinding and hobbing machines. Although the nose end of the spindle is tapered 7 degrees 7½ minutes per side, the same shape of groove can be applied to straight bodied shafts or spindles. The tool is fed in at an angle of 45°. The sides of the tool each have a 15°



angle, leaving 30° with the vertical and horizontal planes of the work. On both these surfaces, the depth of cut is 1/32". The point of the tool is rounded as explained previously. The width of cut at A is 1/16" for diameters of spindle noses from 2½" to 7¾". From 7¾" upwards to 16¼", the depth of cut is 3/32". The width of cut at "B" for the same ranges of diameters is ⅛" and 3/16".

Relative to the mounting of ball and roller bearings, the holes of the inner races are "radiused," the dimension of which depends on the size of the bearing. Spindles upon which they are assembled sometimes have a radius in the shoulder corners instead of being undercut. This is shown in Fig. 14. These radii are mostly given in millimeters, and as can be seen, require great skill in making the shaft radius smaller than that of the bearings, otherwise they will not shoulder properly.

Eliminating Relief

The elimination of the grinding relief or undercut is in many instances accomplished by the method shown in Fig. 15. The shoulder corner of the spindle is "radiused" and the hole of the component part is chamfered 45° at "A," somewhat greater than the "radiused" corner.

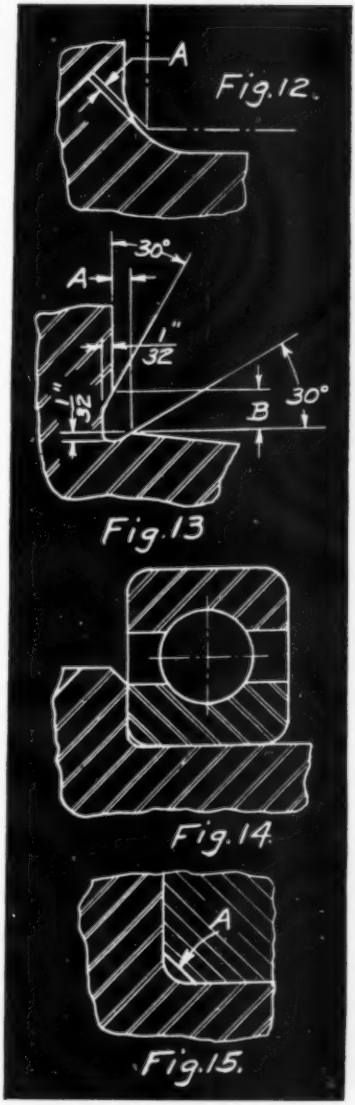
Summarizing the features of relieving for grinding, the points to observe for proper assembling facilities are as follows:

1. There must be no fillet at the coinciding axes of the ground surface planes.

2. Corners should be rounded as generously as possible to avoid cracking during heat treating, but still obtaining the characteristic in point 1.

3. The body of the work should not be reduced more than is absolutely necessary, so as to maintain maximum strength.

4. After the shop standard for relieving has been set, it should appear on all drawings to which it applies and inspection of this phase rigidly followed.



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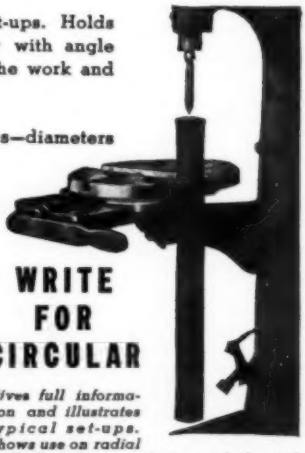

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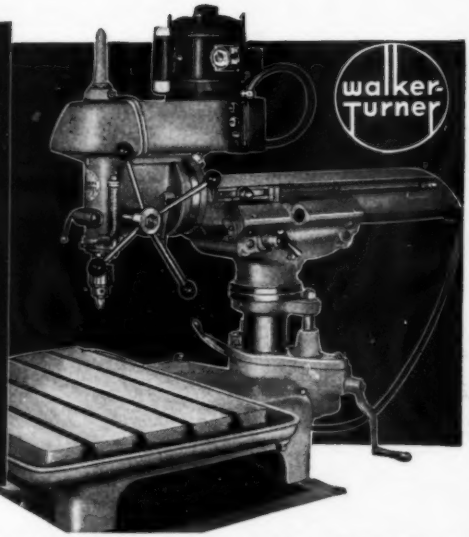
MISCELLANEOUS: drill may be tilted to 45° right or left. Drill press head cast in one piece. Run-out accuracy guaranteed within all industrial standards. Extremely rigid when locked in drilling position. Minimum deflection.



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DEVELOPMENT of Modern Planer Drives

By RAY D. ALLISON

PLANER Drives have been improved greatly in the past few years. This development became necessary since for a while, Planers were not gaining ground because of their slowness. Now it is a fact that planing is still the fastest and most economical way of producing an accurate flat surface.

In the beginning, all Planers were belt driven from overhead line shafts, and the limitations of such drives are obvious. The power actually supplied at the bull gear was greatly reduced, due to slippage of the belt, and the amount of power was greatly restricted as a belt can only stand so much.

Unless a special countershaft was employed, it was impossible to cut or return at more than one speed. Later the "tu-speed" countershaft was developed which provided two speeds to the table and was thought sufficient at the time.

In some shops where it was impossible to locate a Planer under a drive shaft, it was necessary to mount a separate motor above the Planer and belt it down to the machine proper, as shown in Fig. 1. This drive is economical but gives only one cutting speed and one return speed. Usually, speed of the motor was arranged to give 40′ cut and 90′ return speeds. Very often this was satisfactory on Planers up to 36, 42 and 48" with a length of 12′ or under. In this way, the customer could use a cheap constant speed motor of about 900 r.p.m. While this drive was very much cheaper, it penalized the customer inasmuch as he had only one cutting speed and could only get power through the machine that could be transmitted by the belt. For this reason, motors on top of the machines were much smaller than would be recommended for the reversing motor drives.

Up to this time, multi-speed A. C. motors had not been developed to present standards and since the demand for a wider range of cut and return

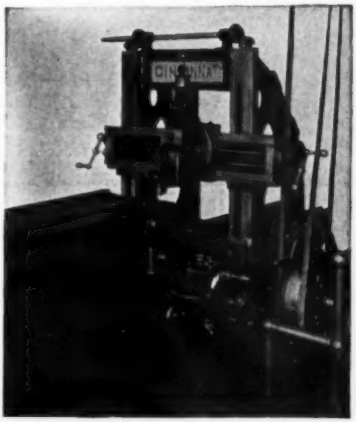


Fig. 1—Early type of overhead single speed drive in which power was limited by belt size.

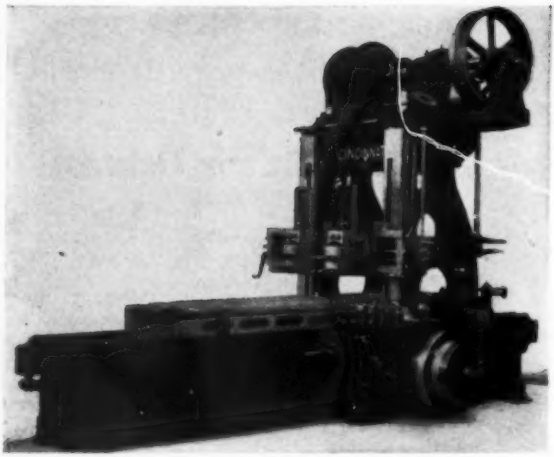
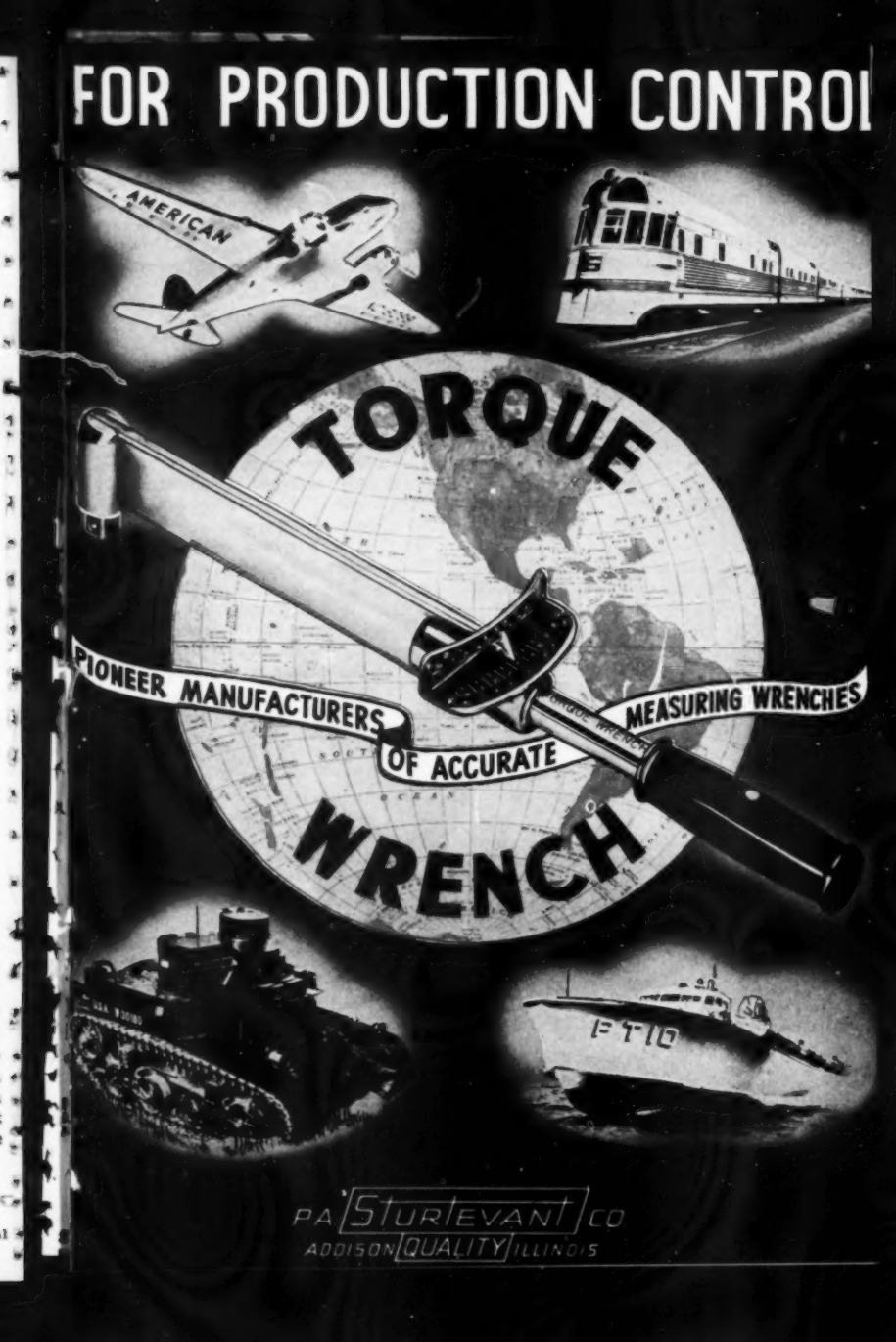


Fig. 2—The next step introduced a speed box mounted on top of Arch, providing either four or six speeds, both cut and return.

speeds became greater, Cincinnati Planer Co., developed a speed box to mount on top of Arch or Column which provided either four or six speeds, both cut and return, according to the customer's specifications. This is shown in Fig. 2.

A greater amount of power is needed on modern Planers, due to heavier cuts and larger work. Also, modern production demands a wider range of cut and return speeds because of new high speed tools and a greater variety in the type of metals machined. Otherwise it would be possible to mount multi - speed motors on top of the Planers and belt them down to the machines. However, the limitations of drives of this type are obvious, as already noted.

It can be seen readily that as the direct current planer motor was developed, there was little use to mount this motor on top of the Planer and belt it down to the machine proper, as considerable power would be wasted through the belts. Therefore, the direct current reversible motor was connected directly to the drive shaft. As the speed of a direct current motor can be varied by varying the current to the field of the motor, it was found that this would be a very satisfactory drive. Any required cutting or return speed could be obtained between the minimum speeds of the motor without sacrifice of power except the loss in the gearing. The efficiency of a gear drive is very high, especially at ordinary planing speeds. Therefore the power loss is low. At the present time, the 4 to 1 reversible motor with motor speeds of 250-1000 r.p.m. is the cheapest of the reversing motors and very satisfactory on all sizes of Planers up to about 16′ table length. Since nearly all planer ratios up to 36″ are 10 to 1, it means that it takes 10 revolutions of the first drive shaft to 1′ of table travel; these motor speeds give 25′ slow cutting speeds up to 100′. The same applies to return speeds. Where a customer has no need of a slow cutting speed we sometimes arrange a ratio to give a higher cutting speed, which in turn gives a higher return speed. A direct connected reversible D. C. motor drive is illustrated in Fig. 3.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The 6 to 1 direct current variable speed reversing motor drive equipment costs about 20% more than the 4 to 1 drive, and the motor speeds generally range from 150 to 900 r.p.m. This gives a wider range of cutting and return speeds, and with a different planer ratio, cutting and return speeds are obtainable from 25′ to 150′ per minute. It takes about 6 to 8′ of table travel to get the motor up to full speed and therefore this wider speed range is useful only on machines with table lengths above 14′ or 16′.

Planer motor reforms have done much in the past few years to reduce weight and change the shape of the motor armature so as to reduce the inertia and obtain quicker reversals. Therefore the customer is able to obtain more cutting strokes per minute. This applies of course to short strokes. It has been determined by experiment and calculations that it takes four times as much power and time to reverse the planer motor itself, as it does the planer table, figured when the right size motor is used for a particular planer. Another speed range of this type is 4 to 1 with motor speeds of 150-600 and also 6 to 1 with motor speeds of 200 to 1200 r.p.m.

In some shops, only A. C., is available. The advantages of a variable speed direct connected motor drive are obvious, so it would be useless to revert to a one speed or even multi-speed A. C. motor, hence the variable voltage reversible motor drive.

At present, there is still a greater demand for a wider range of cut and return speeds. This is due to better cutting tools, more rigidly designed planers and the need for planing different types of metals on the same planer. As a result of these factors, and because some shops have only A.C., the variable voltage reversing direct current motor drive was developed. This equipment comprises a 30 to 1 D. C. reversing motor combined with a motor generator set and gives a very wide speed range running from 40 to 1200 r. p. m. Ordinarily, it provides cutting and return speeds from 8 to 240′ per minute. With this type of drive, speed of the motor is not only varied

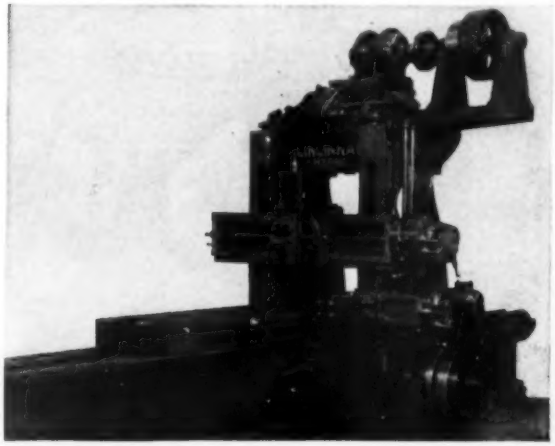
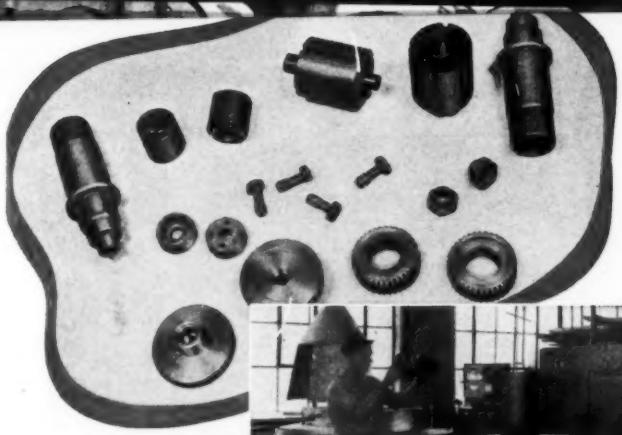


Fig. 3—Here is a direct connected reversible d.c. motor drive.



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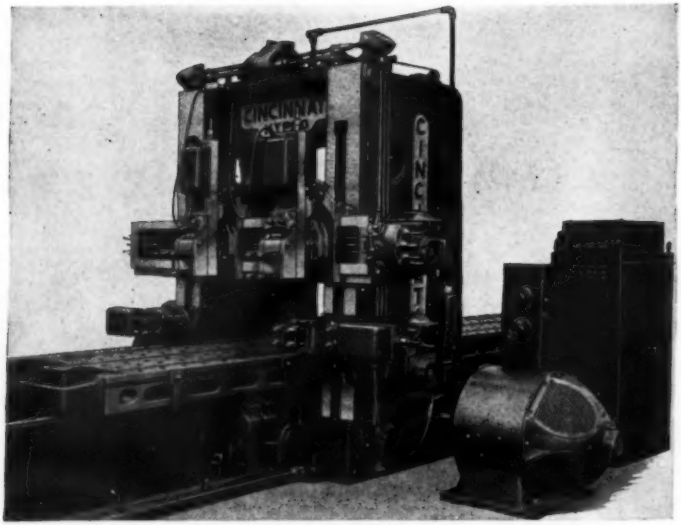


Fig. 4—A further development involving the use of a variable voltage drive.

by varying the current to the motor field but by varying the voltage to the motor. The drive has been found very satisfactory and the number of short strokes obtainable per minute compares very favorably with any other type of drive. Also, you can do any number of different types of work on a Planer so equipped as it is possible to use the latest cutting tools. Fig. 4. shows the variable voltage drive.

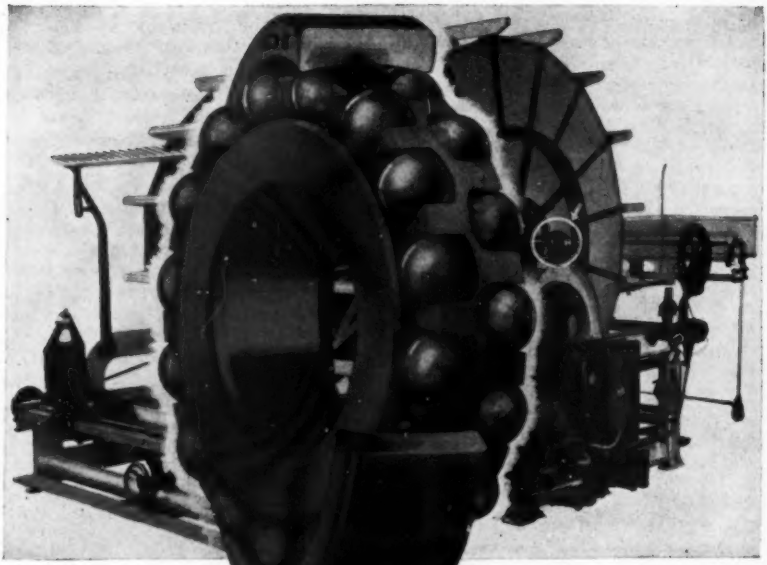
In connection with this type of drive, some of the electrical manufacturers have conducted experiments to determine exactly what a Planer manufacturer can depend upon in the way of strokes per minute and actual cutting and return speeds. At the same time, we have made tests ourselves and have recorded some interesting data.

In some cases, customers prefer, to buy a separate motor generator set to drive either the 4 to 1 reversing equipment or the 6 to 1. In many such shops, it may be advisable to purchase a separate motor generator set, for it provides D. C. for other equipment, such as electric chucks, hoists, etc. Where it is confined to the Planer only, the variable voltage equipment is superior because it affords a greater speed range and more strokes per minute.

An accompanying table presents comparisons of the constant voltage variable speed motor drive with the variable voltage type.

It is evident from the tables that a gear driven Planer with a variable voltage drive will furnish the maximum in Planer efficiency.

In calculating the theoretical number of strokes per minute from the table speeds, and neglecting time of reversals, it can be readily understood that the theoretical number of strokes obtained with any motor drive is much higher than the actual number of strokes, ex-



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pecially on short-stroke work. But the actual number of strokes approaches the theoretical amount as the length of stroke increases. As an example, assume a 9" stroke with a cutting speed of 80 feet per minute and a return speed of 240 feet per minute. The theoretical number of strokes is 80 per minute. The actual number of strokes taken from actual tests is 46 per minute. The actual efficiency therefore is 57.6%.

In considering a 2 foot stroke, the theoretical number of strokes is equal to 30 per minute. The number of strokes is obtainable by actual test was 21 per minute. Therefore, the efficiency of the planer drive on the 2 foot stroke is equal to 70%.

If we increase the length of stroke to 5 feet, we find the theoretical number of strokes per minute is equal to 12. The actual number of strokes obtained from tests was 10 per minute. Therefore the efficiency of a planer drive on a 5 foot stroke equals 83.4%.

From this it is obvious that the actual time of reversing the planer motor and table is quite a factor on short-stroke work, but becomes relatively unimportant on long-stroke work.

On the modern Cincinnati Hypro Planer, the table dogs act directly on the master reversing switch, which cuts down the actual reversing time. If the planer is equipped with magnetic feed and either electric or pneumatic tool lifters, the table dogs, hitting the master switch, directly control both time of feeding movement and lifting of the tool blocks.

In the case of pneumatic tool lifters, the master switch, through the control panel, operates an electric air valve which provides and cuts off air supply to the tool lifters. A small plunger

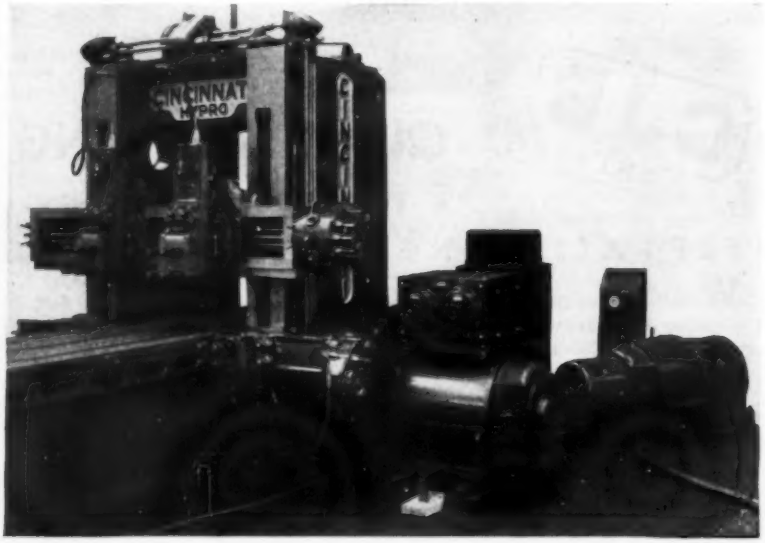

Fig. 5—The latest in planer drives—a Cincinnati Hypro unit with Westinghouse variable voltage equipment.

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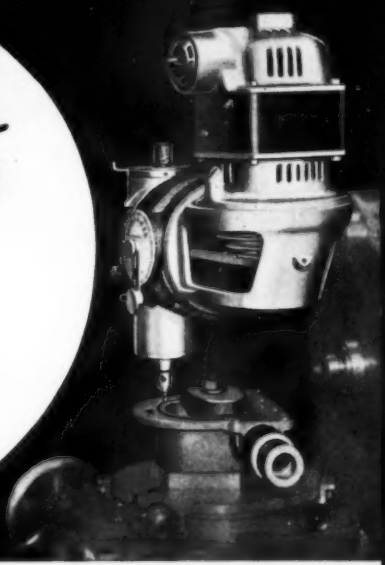

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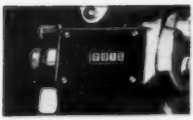

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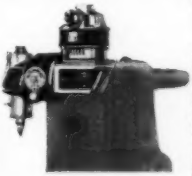

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COMPARISON OF MAXIMUM STROKES PER MINUTE ON CINCINNATI HYPRO PLANER

	Variable Voltage		Constant Voltage
Gear Ratio of Planer	6:1	5:1	6:1
Horsepower	30	30	25
Range of Cut Speed (Ft. per min.)	7-200	8-240	25-150
Range of Ret. Speed (Ft. per min.)	7-200	8-240	25-150
Length of Stroke:—		Number of Strokes Per Minute	
9"	41	46	31.5
12"	33.3	37	25
24"	21.	21	16.3
36"	14.3	15	12.2
48"	11.5	12	10.5
60"	9.8	10	9

COMPARISON OF NUMBER OF STROKES OF GIVEN LENGTH PER MINUTE AT DIFFERENT CUT AND RETURN SPEEDS, 48" x 48" x 16' CINCINNATI HYPRO DOUBLE HOUSING PLANER CINCINNATI HYPRO — 5 to 1 GEAR RATIO

Length of Stroke	80' cut—150' ret.	80' cut—240' ret.	150' cut—150' ret.	150' cut—240' ret.
9"	37	46	42	49
12"	30	37	35	42
24"	17	21	20	25
36"	12.5	15	15	18
48"	10.0	12	13	15
60"	8.5	10	11	13

NOTE—The above are calculated from test curves made on variable voltage Planer equipment —35 h.p.

in the slide is forced out under air pressure and pushes the tool block up.

In the case of electric tool lifters, the master switch controls, through the control panel, the current to the solenoid mounted on the upper end of the slide. The solenoid operates the mechanism, which in turn lifts the tool blocks.

Newer and better cutting tools, better and more convenient controls, and changes that have eliminated faults in the old designs, have made the modern Planer much more productive and satisfactory. More and better work per hour can be obtained with less operator fatigue than was possible heretofore.

Furthermore, the appearance of the planer has been greatly improved, keeping it fully abreast of the more pleasing lines now found in all machine tools.

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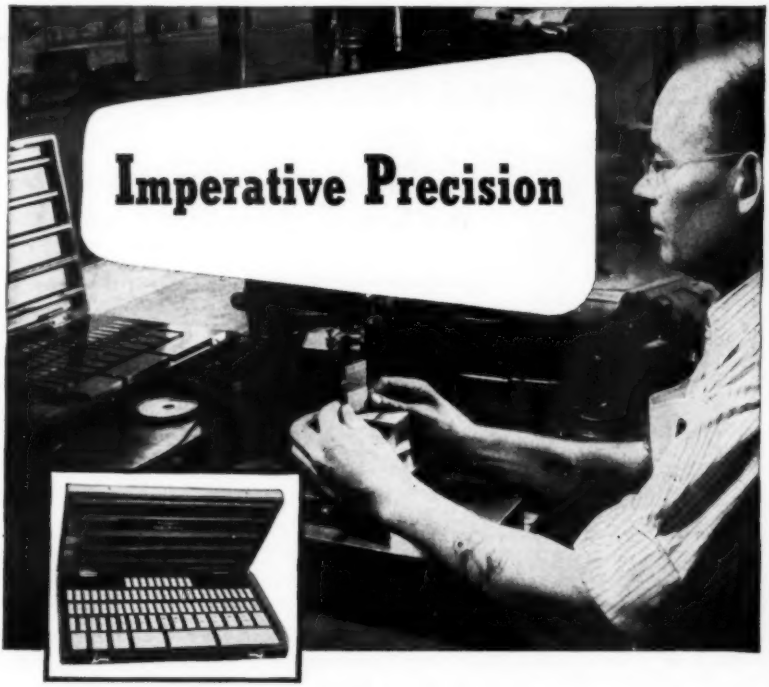

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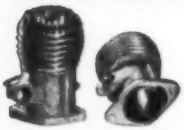

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SUNNEN PRECISION HONING MACHINE

Dynamic Balancing

By WERNER I. SENGER

AS has been pointed out in a recent article on the subject*, the need for maintaining static and dynamic balance in the many rotating parts of present day machinery is becoming increasingly important to every manufacturer, whether the product is large or small, and particularly in connection with the Defense Program. Among the products which have benefited by the introduction of accurate balancing equipment such as the Dynetric Balancing Machine (the principles and operation of which were described in this same earlier article) are present day automobiles. One of the most important of the many applications of balancing machines in the automotive industry is the balancing of the rotating parts of automobile motors.

Accumulative Errors

To obtain the ultimate in smooth operation of a motor, it is desirable to balance the complete assembly of crankshaft, flywheel, clutch, and belt pulley with vibration dampener. Assembly balancing of these parts will eliminate any accumulation of balancing errors in the individual parts and will also eliminate those errors in balance which are due to the fit of one part on to another. For example, it is quite common practice to balance each end of a crankshaft to an accuracy in the neighborhood of ¼ ounce inch. Further, it is quite general practice to balance the flywheel and belt pulley with vibration dampener to a similar order of accuracy while the clutch is generally held to an accuracy of only ½ ounce inch. It is obvious, therefore, that on the flywheel end of an automotive crankshaft assembly, it is possible to have ¼ ounce inch of unbalance in the crankshaft plus ¼ ounce inch unbalance in the flywheel, plus ½ ounce inch of unbalance in the clutch, accumulating to give as much as one ounce inch of unbalance in that end of the assembly. To this unbalance must be added the effect of any slight looseness of the flywheel on the crank flange, together with any effect of eccentricity of the crank flange with respect to the main bearings of the crankshaft. Even though the flywheel and clutch assembly may weigh as little as 30 pounds, one thousandth of an inch of looseness of the flywheel on the crank flange will introduce an unbalance of ½ ounce inch. To this may be added the effect of a possible .001" of runout of the crank flange with respect to the main bearings of the crankshaft, which will produce an unbalance effect of similar order. From these figures, it is obvious that it is possible to get unbalances of two ounce inches from the errors accumulating in the parts of

*"Recent Developments in Balancing Machines," Machine Tool BLUE BOOK November and December, 1940.

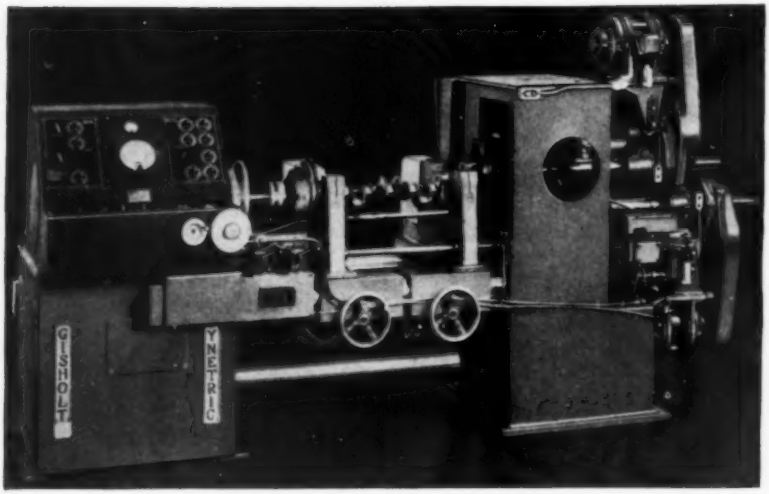

Fig. 1—Type 3U Dynetric Balancing Machine incorporating drilling spindles for removing unbalance.

which the crankshaft assembly is made.

A recent development making possible the location, measurement, and correction of such unbalance forces is shown in Figure 1. This unit consists of a Type 3U Dynetric Balancing machine, which locates and measures the amount of unbalance in each end of the crankshaft assembly, and Leland-Gifford Drilling Spindles for removing the unbalance in accordance with the machine indications. With this type of equipment, it is possible to measure, correct, and inspect 25 automotive type crankshaft assemblies per hour to an accuracy of 0 2 ounce inches in each end of the assembly.

Measurements of unbalance observed on the balancing unit are transferred by electrical means to cams in the correction drilling spindles, thus setting them to the depth of correction hole required to remove the unbalance.

All control for the machine is concentrated at the operator's position in front of the balancing unit (See Figure 2.) By means of a suitable hoist, the operator loads the assembly into half bearings in the flexible supports of the balancing machine and inserts the flexible end drive shaft into the driven member of the clutch to permit rotating the work from the driving means of the balancing unit. The operator presses the start button "K" to start the machine in rotation. The balancing machine is provided with a switch lever "J", which has two positions marked "Right" and "Left", corresponding to the belt pulley and flywheel ends of the work. The machine is also provided with another two-position switch "H", which is marked "Angle" and "Am't." These two switch positions correspond to the two indications which it is necessary to take on each end of the assembly in order to determine the condition of balance:—namely, the angular location of the unbalance and the magnitude of the unbalance. With the

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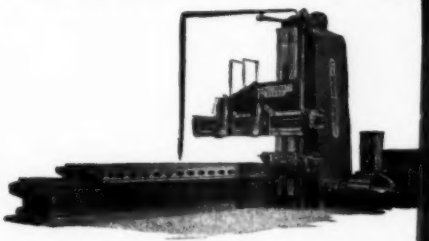

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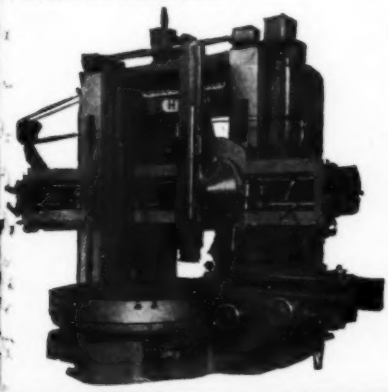

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switch "J" on "Right" position and with switch "H" on "Angle" position, the operator turns the dial "F" until the meter needle "O" is moved to zero position. The reading observed on the angularly graduated dial "L" is then set on dial "C" as a record of the angular location of the unbalance in the flywheel end of the assembly. The switch "H" is then turned to "Amount" position and dial "D" is turned until the needle of meter "O" reads zero. The setting of dial "D" indicates the amount of unbalance in the flywheel end of the asembly.

The angular location of the unbalance in the belt pulley end of the assembly may be determined by throwing switch "J" to "Right" position and switch "H" to "Angle", turning dial "F" until the needle in meter "O" reads zero. On dial "L" will be recorded the angular location of the unbalance on the belt pulley end of the assembly. With the switch "H" moved to "Amount" position, dial "E" may be turned until the needle in meter "O" again reads zero. The reading of dial "E" will then record the amount of unbalance in the belt pulley end of the assembly.

Attached to the shafts of dials "D" and "E" are position or "Selsyn" motors, one for each dial. The Selsyn motor attached to dial "D" is connected to a receiving position or Selsyn motor in the lower drill spindle which will be used for correcting unbalance in the flywheel end of the assembly. The Selsyn receiver is shown at "N" of Figure 3. This receiving Selsyn motor

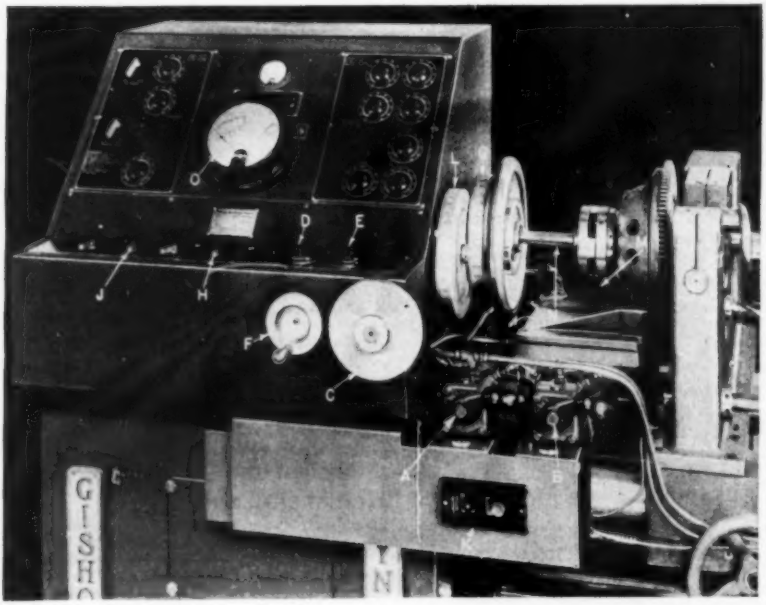

Fig. 2—Operator's position, where all controls are centralized.

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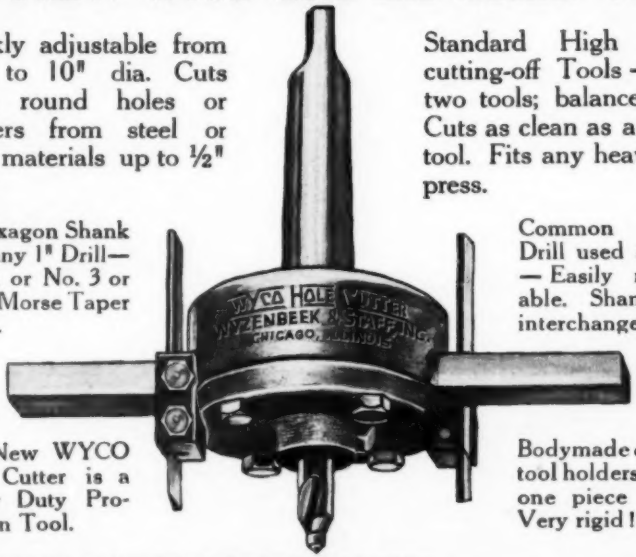

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carries a suitable cam by means of which depth settings are provided for the drilling spindle into which it is incorporated. The cam on the receiving Selsyn does not in itself act as a depth stop, but does serve to set the oil-operated depth stop of the drill spindle. This drill spindle is arranged to be operated by means of the lever "A" shown in Figure 2. Throwing lever "A" will cause the drill spindle to rapid traverse up to a position close to the work. The drill spindle then continues its advance at a feeding rate, but depth measurement as set from the Selsyn cam is not initiated until such time as the drill has actually made contact with the work itself. The drill will continue its advance at feeding rate until the depth set by the Selsyn cam has been reached, at which time the drill will retract at traverse rate.

Connected to the dial "E", (Figure 2), is another transmitting Selsyn as previously described, which is con-

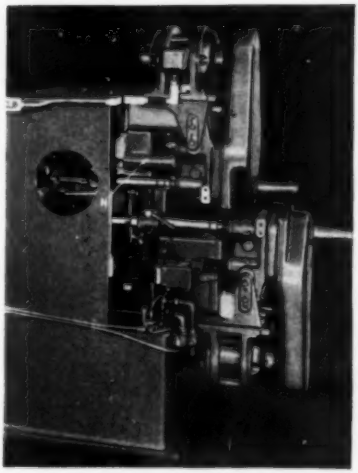
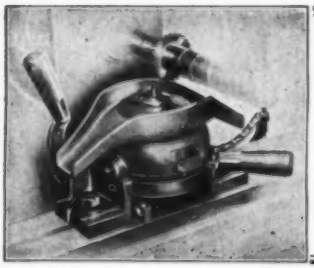


Fig. 3—Position or "Selsyn" motors attached to dial shafts control drilling depths through cams.



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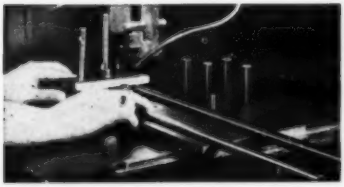

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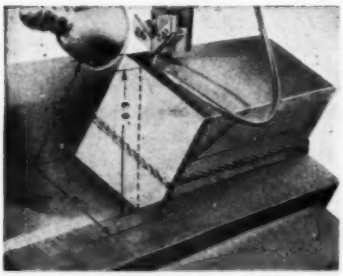

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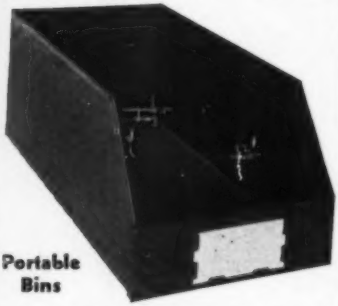

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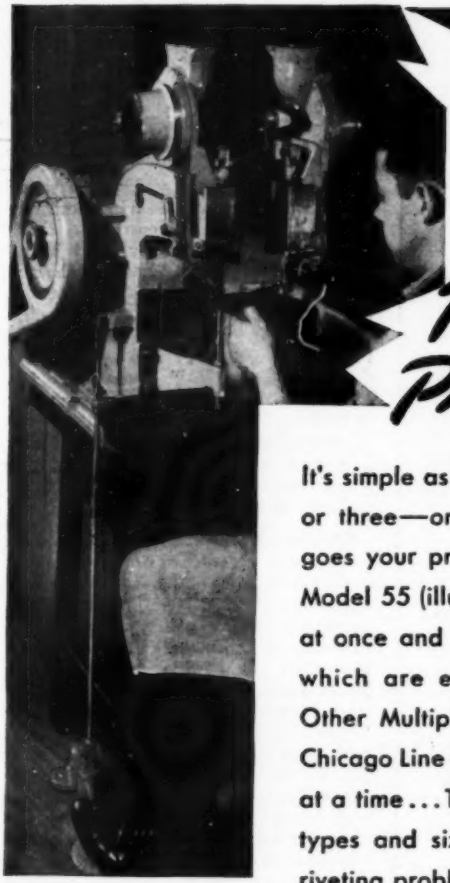
nected to a receiving Selsyn on the upper drill spindle (Figure 3). This Selsyn receiver carries a depth cam, which is moved by the rotation of the dial "E". This depth cam will provide a stop on the depth of hole to be drilled, which will exactly correspond with the amount of unbalance indicated by the dial "E". The lever "B", (Fig. 2), serves to start the upper correction drilling spindle, which is arranged to enter into the belt pulley end of the assembly.

After the operator has determined the amount and angular location of the unbalances on both ends of the piece, and has them recorded on dials "C", "D", "E", and "L", he turns the crankshaft assembly by means of the hand wheel "G" until the angle shown on this angularly graduated handwheel corresponds with the setting of dial "C". He then throws lever "A" to start the correction drill into the flywheel. Throwing of lever "A" also causes a hydraulically operated supporting slide to come up to the flywheel to support the work during the drilling operation. As soon as the drill has started to advance, a red light shows, adjacent to the lever "A", indicating to the operator that no further worry is to be done until the drilling cycle has been completed. When the drilling cycle is complete, the red light will turn out and he may proceed to set the dial "D" to the angular location indicated by dial "L". This will position the work so that the unbalance in the belt pulley is in line with the belt pulley drill spindle. Lever "B" is then thrown to cause the advance of the belt pulley correction drill. A suitable hinged oil-operated holding device comes down over the belt pulley to support the work during this drilling operation. While the drill is advanced, there is a red light showing adjacent to the lever "B" to warn the operator that the drill is at work. While the drills are removing metal and un-



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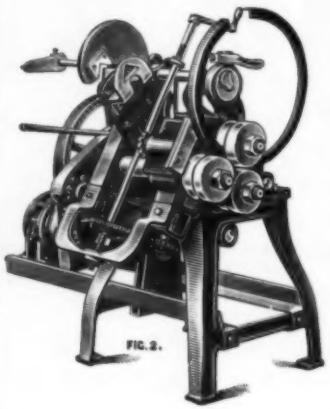

FIG. 2.

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til they have entirely retracted, a small stream of air is blown into the drilled hole to clear the hole of all chips and prepare the work for the operation of inspecting for balance.

When both corrections have been made, the work is inspected for accuracy of balance by repeating the process of measuring as was heretofore described. Because the correction drills are accurately guided by drill bushings close to the work; because the accuracy of electrical transfer from the dials "D" and "E" to the drill spindles will provide a depth setting to an acuracy of .002" and also because the drilling spindles will measure depth from the point of contact with the work to within .003" of a set depth, the overall correction accuracy is exceptionally high and the necessity for making a second correction in the work is almost entirely eliminated.

Of course, there are parts on which a correction is required in excess of that available in one hole drilled to the maximum permissible depth. These parts are readily distinguished in the operation of the machine and constitute less than 5% of the parts balanced. These parts will be directly indicated when the switch "H" is thrown to "Amount" position. The meter "O" will then indicate directly the necessity for drilling two holes and the operator immediately stops the machine and proceeds to drill one correction hole to maximum depth so as to reduce the unbalance to an amount which can be corrected in the normal manner. This single preliminary correction hole is actually drilled 10 or 15 degrees off the indicated angle so that the final correction hole will in no way interfere with this preliminary correction.

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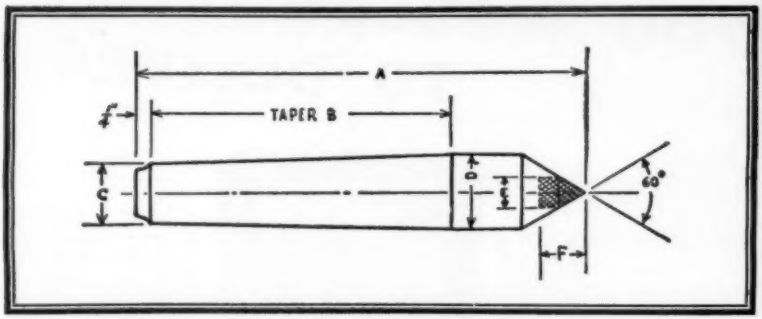

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5	8 5/16	5 3/16	1.475	1.748	5/8	7/8	15.00
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7	4 1/2	2 7/8	.600	.720	5/16	7/16	4.00
8	5 9/16	3 9/16	.750	.898	3/8	9/16	5.50
9	6 1/4	4 1/4	.900	1.077	7/16	5/8	7.00
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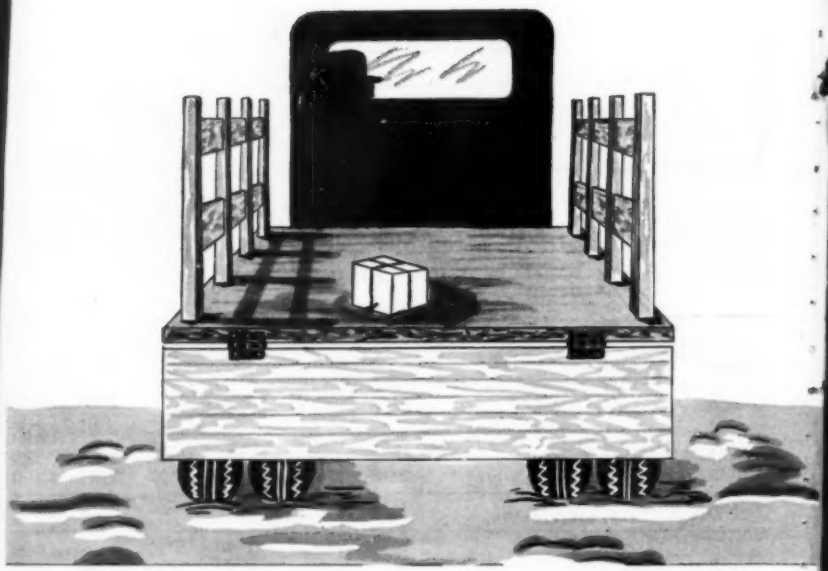

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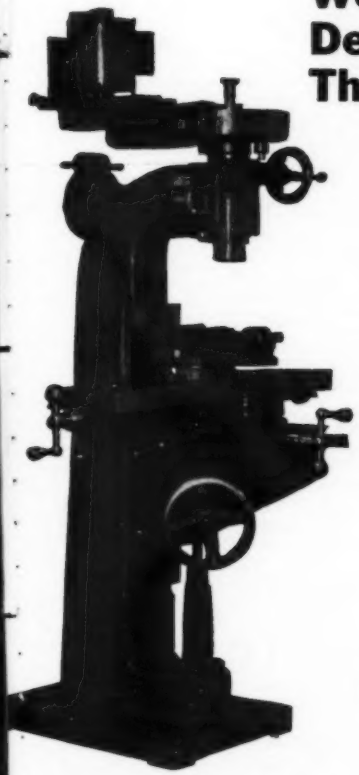

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Steel-Cutting with Carbides

By PHILIP M. McKENNA

LUCKILY, the present excessive demand upon the machine tool capacity of this country has been met by the assistance of an able and willing partner to the modern machine tool—the carbide tool.

The first of the cemented carbide tool metals to make its appearance was tungsten-carbide cemented with cobalt. During the past decade, this has been widely applied to machining of metals of low tensile strengths, such as cast-iron, brass and aluminum. It is characterized by cutting with a crumbly chip, and having a tensile strength generally less than 40,000 pounds per square inch. Speed of cutting with these tungsten-carbide tools on cast iron was 200 to 350 feet a minute, or three to six times as fast as previously customary with high speed steel tools. Tool life was many times that of steel tools on this work.

But these early tungsten - carbide compositions had a habit of adhering to steel chips under tool pressures and temperatures, and "cratering" when it was attempted to employ them for cutting steel. This dimmed the bright promise of a universal tool material, good for machining both cast-iron and steel. Also the rupture strength of these original tungsten-carbide compositions was not sufficient to withstand the shock of cutting rough forgings or castings with sand holes, to say nothing of the interrupted cuts now taken with modern steel-cutting carbide tools, or heat-treated steel parts.

There is a fundamental difference in the way chips come off the point of a tool cutting these weaker metals, and in the chip action when machining steel and tough alloys of higher tensile strength. In cutting with crumbly chips, the frictional heat is produced close to the cutting edge and to carry

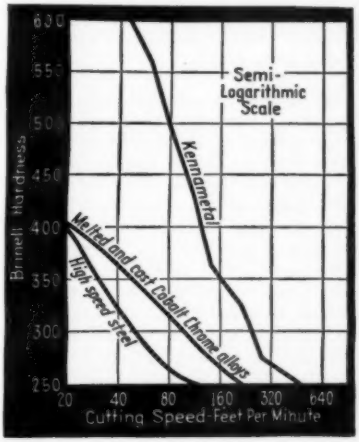

Fig. 1—This graph shows the speed at which these steel cutting carbide tools are customarily operated, compared to the speed of cutting steels with other tools.

away this localized heat, the high thermal conductivity of carburized tungsten and cobalt composition—about 0.17 cal./cm/degC/sec., or 2-½ times that of high speed steel—is helpful. By thermo - couple methods, using the work-piece and the tool material as dissimilar elements, a temperature of 1400 degrees F. was observed at the point of the tool when turning close grained cast iron at a speed of 400 feet per minute.

But in the machining of steel of tensile strength varying from 60,000 pounds per square inch to 270,000 pounds a square inch, a stronger tool material was needed; one that did not "crater" due to the adherence of the steel chip particles to the tool point, resulting in pulling out of grains of the hard carbide. The chip action, in cutting steel, is considerably removed back from the cutting edge, and localized heating is less of a problem. In fact, it is advantageous to have a tool material which throws the heat back into the good-conducting continuous chip, the tool and work remaining cool even at very high speeds.

The discovery of the intermetallic compound, tungsten-titanium carbide, corresponding to the chemical composition $WTiC_2$, and a harder material than tungsten carbide, provided the answer. Compositions made from this ingredient, with binders of carburized tungsten and cobalt, the compositions being cemented in vacuum electric furnaces, were proved to have the requisite strength and hardness for the general machining of steels of a wide range of hardness, up to 550 Brinell.

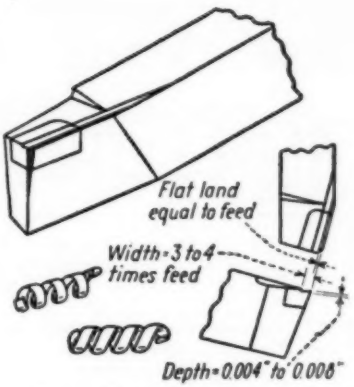

Fig. 2—When turning most steels above 0.35 carbon and harder than 250 Brinell, this tool will produce short, coiled strips.

The characteristics of this product, made in three grades of hardness by varying the proportions of ingredients, are shown in an accompanying table.

For comparison purposes, it may be noted that high speed steel has a hardness of 65 Rockwell "C" and a transverse rupture strength of about 450,000 lbs. per square inch.

These steel-cutting compositions have very high compressive strength, up to 690,000 pounds per square inch. They have a certain degree of elasticity necessary for their use as steel-cutting tools, which is not possessed by the more rigid cemented tungsten carbide. Manufactured in vacuum furnaces, and not sintered in hydrogen as is tungsten carbide, they are free from localized embrittlement; consequently when

Physical Characteristics

Grade	Rockwell "C"	Hardness "A"	Strength, lbs. sq./in. transverse rupture	Thermal Cond. Cal/degC/cm/sec
KH	78.0	91.1	244,000	.074
KM	76.6	90.6	305,000	.113
K3H	79.0	91.6	210,000	.068

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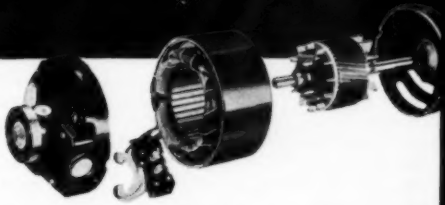

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ruptured by fracture they "flake" rather than shatter. Thus they may be re-ground many times in use as tools. The surface characteristic of this fine-grained steel-cutting tool metal is such that it does not adhere or "gall" on hot steel chips as it cuts them. Surfaces cut with these tools are typically smooth.

Ernst and Merchant (American Society for Metals, October 1940) in a paper entitled "Chip Formation, Friction and High Quality Machined Surfaces" point out that efficiency in cutting metals is associated with low coefficient of friction between the tool surface and the metal being cut. A test of cutting efficiency is the freedom from "built up edge" or tearing of the surface. This condition is typical of steel work cut with the steel-cutting carbide tools.

The design of lathe and boring tools made from the new carbide metal is a consequence of its characteristics. The favorable factors are its freedom from galling or built-up edge, its very high compressive strength, the hardness of the tungsten-titanium particles, and their suitable thermal conductivity. Its unfavorable characteristic is its lower tensile strength compared to high speed steel. Accordingly, the design of the cutting point is made with a view to keeping the cutting portions under compression rather than tension. This is accomplished by using low rake angles, providing a more obtuse wedge or cutting angle. In fact, for interrupted

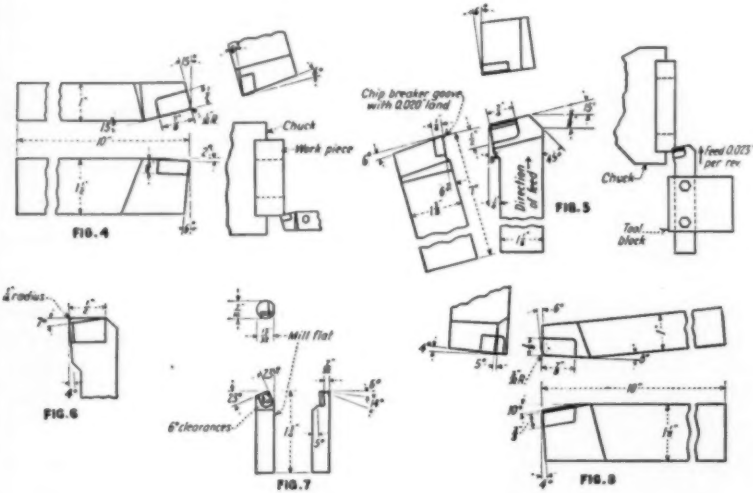

Fig. 3—Different tools for different jobs. (a) This carbide tipped tool is suitable for many facing cuts in steel. A chip-breaker groove is not necessary for most facing operations. (b) Used in turret lathes for facing gear blanks, this tool has a chipbreaker groove along the cutting edge. (c) This facing tool, having a chip-breaker groove at a 7-degree angle with the cutting edge, can be used when facing to a 90-degree shoulder. (d) Tools of this design set at 75-degrees from the axis of the boring bar are suitable for boring long holes in steel tubes. (e) Recommended for planing and shaping operations, even with "jump" cuts, this carbide-tipped tool has negative side and back rake.

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FIG. 2

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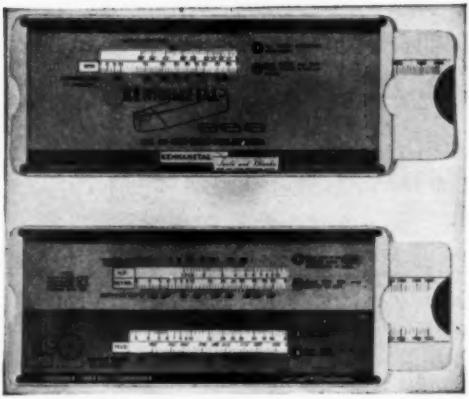

Fig. 4—This slide rule calculator has considerable utility when used to select combinations of feeds and speeds for cutting with carbide tools when fixed depths of cut and horsepower are available on the machine.

Fig. 5—A typical carbide tool with chip-breaker ground in the tip. This particular tool has a 7" square shank.

or "jump" cuts, negative rake angles are successfully employed, making the included angle between the top surface of the tool and the front clearance actually greater than 90 degrees.

From the formula of Ernst and Merchant's paper:

Efficiency

$$\frac{C.\ \mathrm{Tan}\ \left(45^\circ + \frac{a}{2} - \frac{T}{2}\right)}{2S'}$$

Where s' is expressed in pounds per

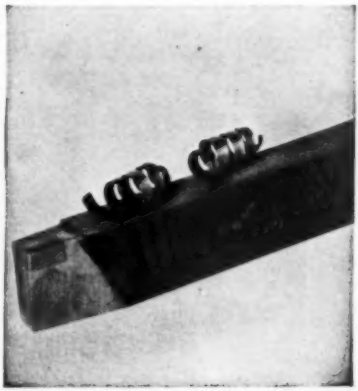

Fig. 6—A cemented carbide tool showing typical chips produced by it.

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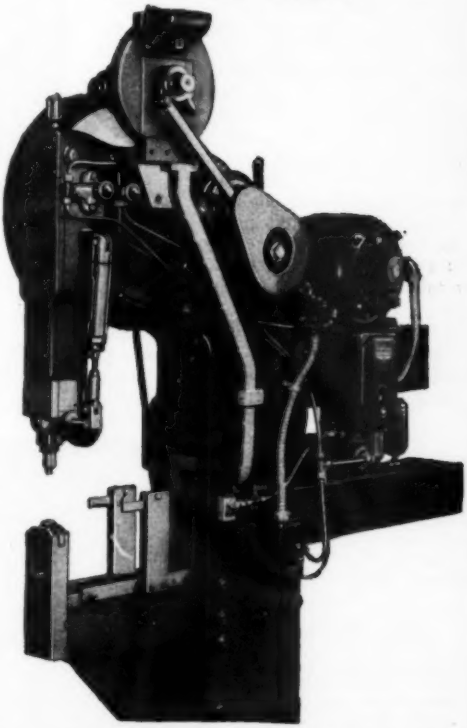

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square inch, and efficiency is given in cubic inches per horsepower per minute, the constant "C" will have the value 396,000. We can then see why the efficiency of cutting, due to lower coefficient of friction, compensates for the loss in efficiency due to using lower rake angles, for in the above formula "a" is the "true rake angle," and "T" is the "decrease of friction" angle. Since the tangent of 45° is 1.000 and the two compensatory factors, "a" and "T," practically annul each other when the rake angles and friction coefficients are very small, the efficiency is unchanged by the use of carbide tools with low rake angles.

At any rate, the evaluation must be left to more precise observations than available at present. For practical purposes the slide rule calculator, shown in figure 4, and having an ample margin for frictional losses in the machine tool, is of considerable utility in selecting combinations of feeds and speeds, with fixed depths of cut and horsepower available on the machine.

It has been estimated that the use of tungsten in the form of tool tips of cemented carbide, results in 20 to 60 times

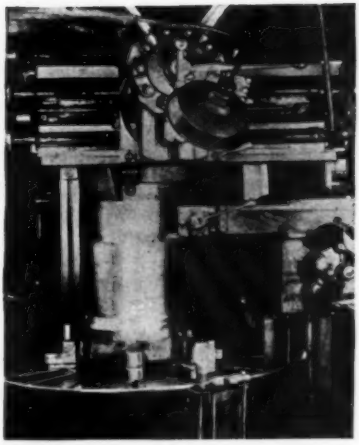


Fig. 7—Turning and boring SAE-3145 forging

EXAMPLES OF SAVINGS MADE WITH CARBIDE TOOLS

	Speed	Feed	Depth
Roughing	245 ft./min.	0.033	¼"to⅜"
Finishing	290 ft./min.	0.015	1/16"

Time cut from 7-½ to 3-¾ hours floor to floor time by use of cemented carbide tools.

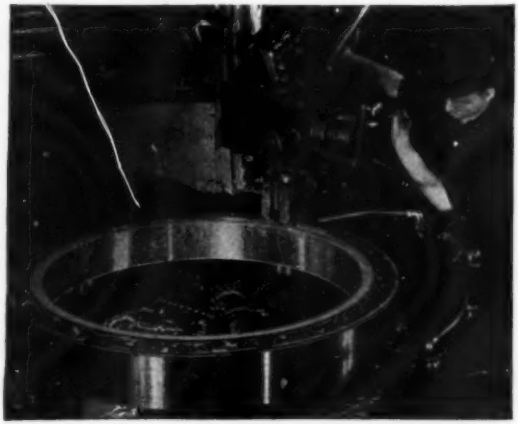
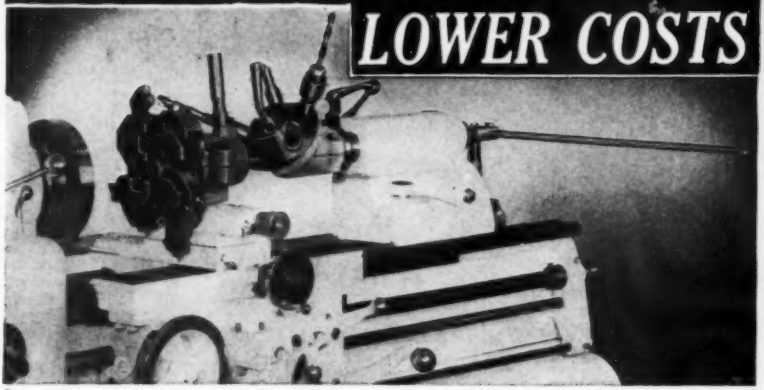
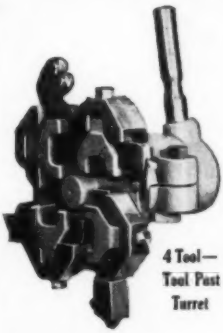


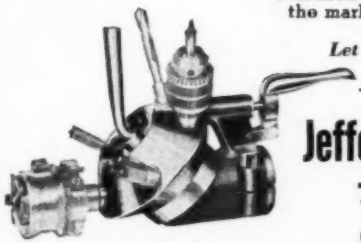
Fig. 8—Tool costs were cut 51 percent in machining heat-treated ring-gears by use of cemented-carbide tools. Machining operations on this ring gear include turning the inside and outside diameters and facing.

SPEED-UP PRODUCTION— LOWER COSTS





4 Tool—
Tool Post
Turret



5 Tool—Tail Stock Turret

Here's a quick and economical method of converting your engine lathes into complete, accurate. turret lathes—by installing the Jefferson Tail Stock Turrets, the Jefferson Tool Post Turrets and the Jefferson Adjustable Pull-Feeds.

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Fig. 9—Carbide tools reduced tool costs 50 percent in the machining of heat-treated 0.40 to 0.50 percent carbon steel gear blanks. Finished blanks are 7-7/16" in diameter, have a 1" face, and are heat treated to a hardness of 255 Brinell.

as much work done per pound of tungsten as when this strategic material is employed in tungsten high-speed steel. Not only does the raw material go further in producing work, but it does that work with a 30 to 50% saving in time.

Machine tool manufacturers should bear in mind the requirements for more power at the point of the tool. This increased power may be best applied through increased speed, thus not exceeding the forces now required to chuck work securely and push it without too much bending of elements of machine construction.

There is need for more power on machine tools, for the business of machining is to convert electric power into piles of chips in the least possible time. Motors and drives capable of speed changes to adapt the turning speed of the work to the best cutting speed are needed.

Standard Electrical Tool Co. Catalog

Electric Grinders, Buffers, Drills, etc. are described in detail and attractively illustrated in the new 36 page catalog (No. 43) now being distributed by the Standard Electrical Tool Co., 1954 West 8th St., Cincinnati, O.

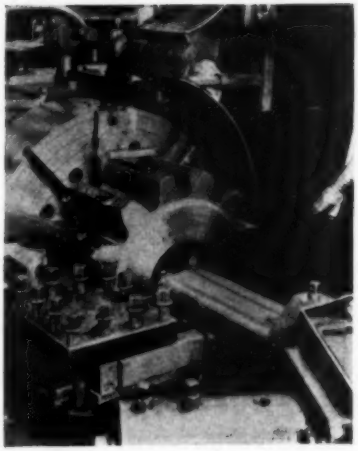

Fig. 10—Carbide tools gave 5 times the production and pieces per grind given by high-speed steel tools in the machining of cast-steel rack pinions. Machining operations include turning, facing, and boring over interruptions and sand holes. Speed of cut is 155 feet per minute with a feed of 0.032", and depths of cut from 1/4 to 5/16". Coolant used is soap water. Analysis of the cast-steel is:—Carbon, 0.05—0.35; Nickel, 1.50—2.00; Chromium, 0.60—0.90 Tensile Strength, 90,000 p.s.i.

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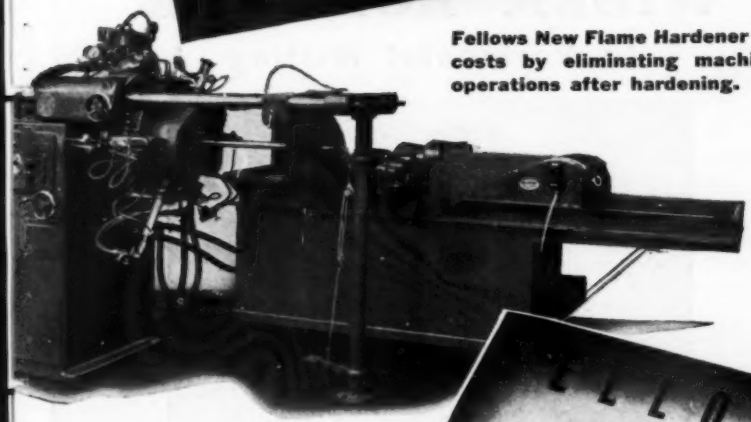

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Servicing Tools and Shop Methods

By A. BRUNELLE

UNTIL quite recently, nuts and bolts were tightened exclusively "by feel." That is to say, the wrench being used was pulled up the same amount by feel for a series or set of nuts or bolts, trusting entirely to the mechanic's judgment as to when he thought the proper stress was reached.

Now, however, the day of reckoning has arrived when we have to stamp out or at least minimize the well-known evil of unequal, over and under tightening. The mechanic, notwithstanding all his inborn honesty, probably does not realize:

That the position of his hand on the wrench handle or that the distance the wrench handle slides in or out of the cylinder nut wrench or spark plug wrench changes his control over tightening tremendously. For example, where a 50 pound pull applied at a

Fig. 1—Setting cylinder hold-down studs on Wright Cyclone 14 engine.

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point on the handle 10" away from the head of the wrench results in a torque of five-hundred-pound-inches, sliding the hand or wrench handle in or out one inch changes this torque fifty-pound-inches either way.

That the spark plug skip discovered, let's say, in Number 2 cylinder is due to improper tightening. That is, it is possible to distort the spark plug outside shell and cause the cores to loosen when too much force is used.

That the broken stud at Number 14 cylinder was caused by tightening the nut with that easy-to-use long handled wrench, just after a beefsteak lunch on a day when he was feeling particularly fit.

Fig. 2—Close-up of operation of setting hold-down studs on Wright Cyclone 14 engine.

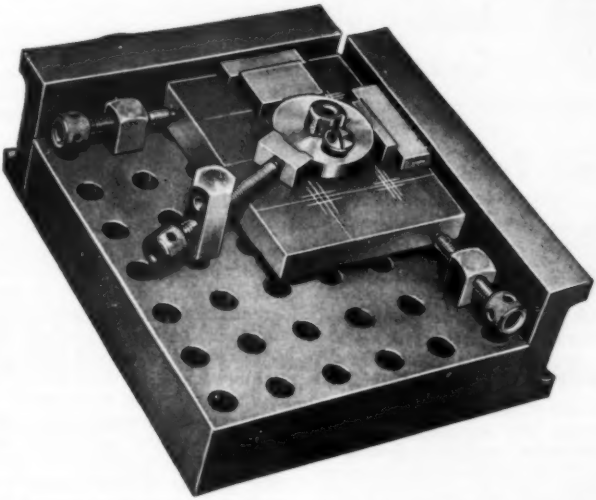
That a nut which he considers just tight enough with one wrench, stresses the stud beyond the elastic limit when using another wrench having a longer handle.

That when a nut is tightened to the stud's elastic limit and then backed off, the stud's ability to withstand power

Eliminate Costly Equipment

with this

ANGLE PLATE "HOLOCATOR"



For accurate locating of all drilled and reamed holes and the laying out of dies and drill jigs, you can perform this task very quickly with this tool-makers' device.

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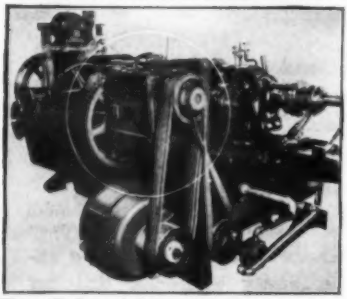

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loads and vibration has been definitely impaired.

The foregoing points and many more can be laid at the door of the "human element," and we have gone to some length in dwelling on this fact that highly stressed threaded parts can not be tightened efficiently by the human sense of "feel." Fortunately, however, the so called "torque" wrench is rapidly clearing up our difficulties in this direction even though there is yet not one single real honest-to-goodness torque measuring device, used in this connection, that is ideal.

It is common knowledge that even when using a torque wrench, a set of nuts can be tightened to a certain torque value and yet if the wrench is released too quickly, the tightness of the set of nuts will vary from each other and the desired value. In the torque wrench, by necessity and virtue of its function, there is a potential of spring power built up as the nut is being tightened and at the very instant that the torque value is reached, as indicated on the wrench scale, this spring power has not yet been expended. Therefore, as pointed out in our Service Station Bulletin, one must wait until the nut stops turning at the given torque to insure that the nut is properly tightened.

What is this characteristic which makes it necessary to wait several seconds in order to expend the spring power in the torque wrench? Shall we call it frictional lag? What is its origin?

To analyze it, we can say that it is a combination of the following manufacturing and physical variables:

1. The stud thread's pitch diameter which has a manufacturing tolerance of two thousands of an inch.
2. The stud thread's surface finish.
3. The nut thread's pitch diameter tolerance of three thousandths.
4. The nut thread's surface finish.
5. The stud and nut surface contact.

HAMMOND "4" CHIP BREAKER GRINDER

"By-Guess-and-by-Gosh" grinding of Chip Breakers into Carbide Tools has no place in Defense production. You'll get hair-line precision with HAMMOND'S Modern "4" Chip-Breaker Grinder. Three planes of adjustment with the new ANY-ANGLE vise. Left side of machine rough or finish grinds . . . right side grinds chip-breakers. Here's complete Carbide Tool maintenance.

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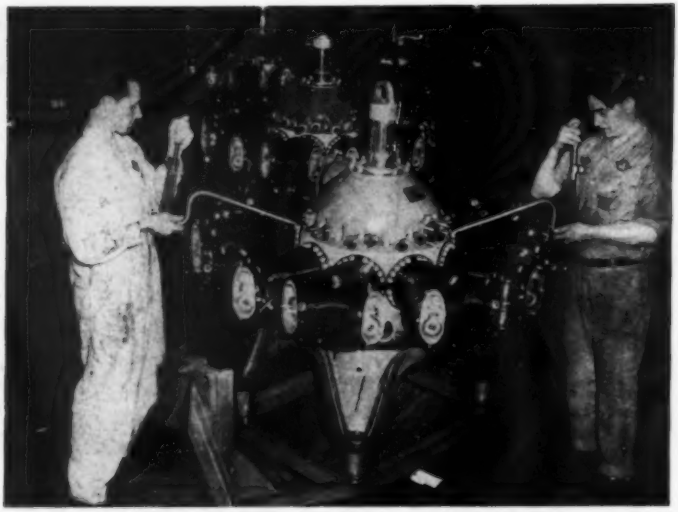

Fig. 3—Tightening cylinder hold-down stud nuts on Wright Cyclone 9 engine.

6. The cylinder flange and washer surface contact.

7. The cylinder flange and washer surface finish.

8. The washer and nut surface contact.

9. The washer and nut surface finish.

10. The amount of lubrication on all of the foregoing surfaces.

Whatever are the detailed reasons back of this particular characteristic of torque wrenches, the important thing is that we know the proper technique to overcome it.

The principal factors involved in the tightness of nuts are often confused but, as shown on Figure 4 for a cylinder hold down nut, they can be analyzed simply as follows:

1. The contact surface of the nut is in "compression" against the washer.

2. The body of the stud is in "tension" resisting the unit. Strictly speaking, there is some torsion in the stud because of the friction between the mating threads when the nut was tightened but this is very minute and can be disregarded.

3. The threads of the nut and stud are in "shear" resisting each other.

4. The nut is not subjected to internal "twist" or torsion, but is only turned bodily on the stud. In other words, the force required to tighten a nut resembles torque in that it is applied in a lateral direction relative to the axis of the stud. In a single piece this action would produce torsion.

5. The tightness of a nut is indicated when the turning is being done and is expressed in terms of torque.

The methods of measuring torque are almost as numerous as the principles used in the many torque wrenches on the market. Thus we have torque wrenches of the type using plate clutch, ball delay, hydro compression in a cylinder, torsion deflection of a bar (best suited to tee handle wrenches), helical

New Convenient Drill Grinding Combination

•

Sellers No. 16 Drill Grinder with steel cabinet pedestal

A new convenience for operators engaged in drill grinding is the steel cabinet pedestal now furnished with the Sellers Model 16 Drill Grinder. It forms a firm, substantial pedestal for the grinder and the work, and a handy cabinet in which to store supplies and attachments. Cabinet and grinder may be purchased separately, if desired.

The Sellers Model 16 Drill Grinder will grind drills from No. 70 (.028") to ½" and produces accurate drill points of 160 to 65 degrees included angle —perfect drill points with equal identical lips. Speeds production. Saves skilled labor for production machine work. Saves drills. Write for catalog and prices.

The cabinet has a working space 13" wide by 30" long and stands 31" from the floor. It is of heavy sheet steel, rigidly constructed and braced to form a vibrationless mount for the grinder. There are three shelves of wood (to avoid defacing tools) with a hinged door and fastener. Finish is standard machine tool gray. Weight 175 lbs.

WM. SELLERS & CO., INC. • 1616 Hamilton St., PHILADELPHIA, PA.

SELLERS 1848

Sellers

spring, and the type used at Wright Aeronautical Corporation at the present time, namely, one using the bending deflection of a bar.

This advice is tendered you about torque wrenches. Select one having the least moving parts to wear or get out of order, and by all means check the calibrations before permitting it to be used. The procedure for checking any torque wrench is as follows:

1. Sight the pointer to coincide with zero.
2. Hold the ½ inch square bit of the wrench in a vise, so that the wrench extends horizontally.
3. Note the weight of the handle itself as registered on the graduated scale.

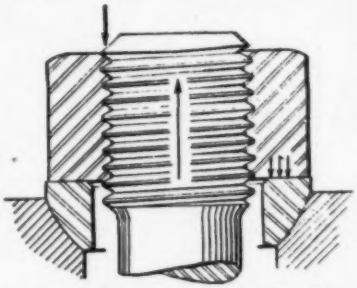

Fig. 4—Illustrating forces and stresses of a tightened cylinder hold-down nut.

4. Hang a known weight at the center of the hand grip and note the total reading on the graduated scale.
5. Measure the distance away from the center of the ½ inch square wrench bit that the weight has been hung.
6. Multiply this distance by the amount of the weight.
7. Add an allowance for the initial reading on the scale caused by the weight of the handle.
8. The total arrived at must coincide with the reading on the gradu-

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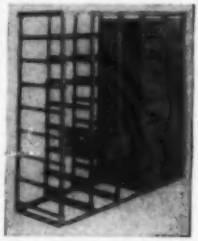

Sterling Racks utilize the space above the floor to the best possible advantage. They save time by making contents of all boxes immediately available—no unpiling to get into the right box. Furnished either with or without steel boxes. Made in units of one or five sections—all welded—rigid—non-tipping—non-swaying.

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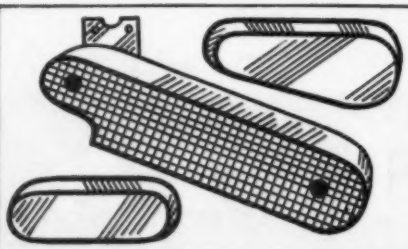

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This latest development in metal cutting machines embodies the advantageous features of hydraulic feed and control. It carries all the fool-proof and enduring qualities inherent in properly designed, oil operated and oil lubricated mechanisms.

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up to 8" in diameter.
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Vertical Milling Machine and
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to save time and
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Get all the details of this machine-equipped with micrometer screw feed quill—direct reading—assures smooth boring accurately to any predetermined depth up to 3".

Write for descriptive Bulletin B.

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Bridgeport, Conn.

ated scale. Actually, three weights are used in this check to verify the wrench's accuracy at low, medium and high pull. That is, we use one weight to give a reading at approximately 150 pound-inches, one to read 300 pound-inches, and one 500 pound-inches.

In connection with the above torque calibration checking procedure, two accuracy limits have been established as follows:

1. The pointer shall be within plus or minus five thousandths of an inch from zero when the wrench is in an idle position.

2. The pointer must read correctly within plus or minus two per cent when checking the wrench with weights as outlined above.

Incidentally, when using a torque wrench, the half inch square bit always must be on the stud's projected centerline. This, of course, eliminates the early type cylinder nut wrenches wherein the handle was not bent back to the projected centerline of the stud.

The torque wrench used here at the factory has a unique feature in the shape of a pivoted handle, eliminating the tendency for still another form of possible human error which may be introduced by the type of handle used.

Laboratory tests, using a torque machine on a torque wrench with a rigid type handle, disclosed an error of 50 pound-inches and more when the hand force was exerted at different parts of the handle, even without moving the hand. However, it will be noted in the procedure above for checking any torque wrench, that article 4 states, "Hang a known weight at the center of the hand grip, etc," and again, article 8 says, "The total arrived at must coincide with the reading on the graduated scale." . . . If the weight is hung by means of a wire, the force is localized where desired, so that the error previously mentioned when pulling by hand is eliminated. Therefore, under these conditions, there is no pos-

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sibility of producing any torque on the wrench other than the true torque, and the reading on the wrench dial must coincide, as in article 8. From the foregoing, it can be seen that even though a satisfactory check is made with the wire method, an erroneous reading can be obtained when the rigid type handle wrench is used by hand.

The pivoted handle, which localizes the force at one particular point, is kept axially in line with the main shaft of the handle by means of two light coiled springs in balance.

"If I Were 21"

By WILLIAM S. KNUDSEN

IF I were twenty-one, I would try to get work in a machine shop. If that failed, I would try for a job in a filling station, or as apprentice to an electrician or a plumber. In short, I would seek to work with my hands.

Nowadays most youngsters want a college education, seemingly because they think it a step toward coveted white-collar jobs. I probably would want one too; but if I knew what I know now I wouldn't let college interfere with my education as a mechanic. Recently I talked with a group of college seniors, worried about how to get a start in life. They were puzzled when I suggested that they look for manual labor. To them, that involved a loss of prestige.

Why? Why is it that so many of our youngsters want to start their careers sitting at a desk. They aren't weak, for on the average they are healthier than we were. They aren't soft or lazy, for they will drive themselves to exhaustion on a football field. Why, then, their dread of manual labor?

In pioneer days, when book learning was rare, the man who made his living sitting at a desk was envied. But the pioneer's legitimate aspiration for learning has decayed into a kind of snobbery which considers it more honorable to handle a telephone than a wrench; more socially desirable to dictate to a stenographer than to direct a crew of skilled mechanics.

That's not the true American tradition. George Washington was a hard-working surveyor; Thomas Jefferson was a gifted designer of useful appliances; Benjamin Franklin was a journeyman printer, an inventor, and the best electrician of his age; Abraham Lincoln split rails, kept a store, built and worked on flatboats. That these men knew how to work with their hands undoubtedly contributed to their hard, practical sense.

In reality, there is nothing "humble" about the position of a mechanic. Certainly the top rank skilled mechanic is still the most sought-after and independent man you can find. The place of America today, the American standard of living, depends more on the skill of our mechanics than on any other one class. The genius of America is production; and many of our productive enterprises are headed by men who have come up from the worker's bench.

(National Safety Council News Letter)

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Automatic Twist Drill Grinders, Face Mill Grinders, Tool and Cutter Grinders, Point Thinners, Tap Grinders, Die Making Machines.

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Recent Welding and Cutting Developments

By FRANCIS A. WESTBROOK, M. E.

AT this time, when acceleration of production is the order of the day, every possible means toward that end is worthy of note, and among such means, gas cutting and welding are important. The processes in themselves are not new, but there have been recent developments which have extended their application and the speed with which such work may be done, as well as effected economies. As a result, there are few machine shops which would not benefit greatly by the use of the equipment now available in this field, which means that the Defense Program would also be benefited.

Before discussing these new developments in welding and cutting equipment, and a few of their practical applications, it will be well to set forth anew just what happens when oxygen is burned in connection with acetylene, or other fuel gases. It has been found that those who understand the reaction clearly generally make the best welders.

When acetylene is burned with oxygen, each part of the former needs 2½

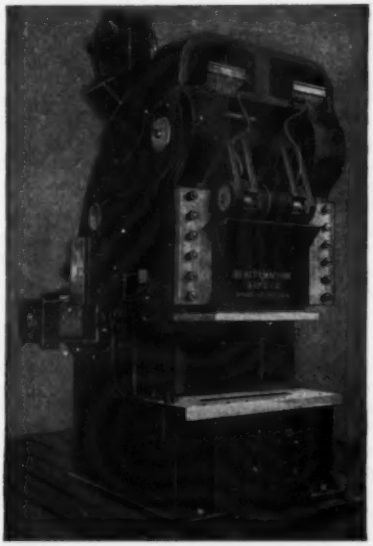
A handy combination of torch and press in operation.

A sheet metal job in process using a portable acetylene generator.

parts of oxygen for complete combustion. One part of the oxygen is supplied by the torch, and the balance is taken from the atmosphere around the torch. While very few welding torches qualify 100% in this respect, the more closely they approximate this condition, the better work they perform. The deoxidation of the air in contact with the metal which is belted by the flame protects the metal against the formation of oxides. It is an essential condition for gas welding and is most satisfactorily realized with acetylene. It is desirable to eliminate harsh flames because they agitate the atmosphere and expose the melted metal to atmospheric oxygen. It is not so important a consideration for cutting operations because cutting is in itself an oxidizing process, and consequently other gases may be used successfully to burn with oxygen.

On account of the blanket of de-oxidized air surrounding the oxy-acetylene flame, it is safe to reduce the metal to a freely flowing state without danger of burning it, as is the case in a forge. The more fully molten the metal the better it can be worked, and the better the weld. Blacksmiths who are accustomed to making welds by heating the metal in a forge know that if it stays in too long, it will be burned, and this is due to the fact that the oxygen blown in at the bottom of the forge is not completely consumed before it comes in contact with the pieces to be welded. Consequently the metal cannot be heated to as high a temperature as it is safe to do with the oxy-acetylene flame with its blanket of de-oxidized air. It is very important to appreciate this fundamental difference in the two methods of welding. Lack of understanding of this difference causes welders not to heat the metal enough with the oxy-acetylene flame, and to have comparatively poor success with their welds. With this neutral flame, the metal may be brought to a flowing stage without damaging its properties.

Recognition of this need of having as large a zone as possible of completely de-oxidized air surrounding the point of application of the flame has resulted in modifications of tip design, etc. whereby the zone has been greatly extended. Research has revealed another matter which has affected tip design. That is, that when acetylene becomes heated to about 350 degrees F., it breaks down and requires more oxy-



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The No. 16 TOGGLE with large die space is suitable for punching and shearing tie plates, punching and straightening splice bars, also for general manufacturing press, punching and shearing articles. Drive is mounted inside of frame.

The Press is equipped with magnetic or air clutch. This is a high speed heavy duty Press for many applications.

GENERAL DIMENSIONS:

	No. 16	No. 16A	No. 16B
Face of slide, right to left	43'	53'	62'
Face of slide, front to back	24'	26'	26'
Die space, slide down	20'	20'	20'
Stroke; Standard	3'	3'	3'
Maximum	5'	5'	5'
Face of table, right to left	53'	60'	66'
Face of table, front to back	24'	26'	26'
Capacity	700T	850T	1000T
Strokes	40	35	30
Depth of throat	15½'	15½'	15½'
Weight	76,000	82,000	88,000 lb.
Motor required Horse Power	20	30	40

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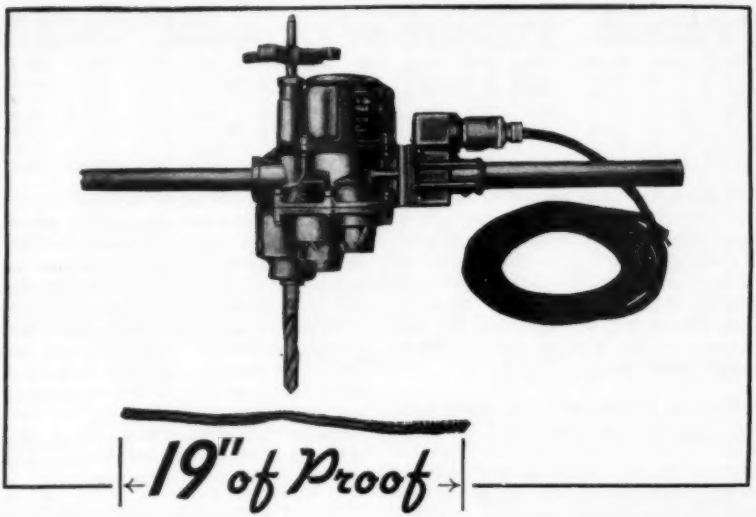
gen for complete combustion. Thus as the tip becomes heated during operation, this change takes place and the weld suffers because of the lack of the blanket of completely de-oxidized air around the work. Consequently, great care has been exercised in the development of some of the most modern torches to do away with harsh flames, and to provide refined mixing chambers and tips so as to improve the operation of welding. In oxy-acetylene welding, the flame is a controlling factor in producing first class work, and unless the proper tip is used the best results cannot be obtained.

In the field of gas cutting, a decidedly new development is the efficient application of the use of city gas and natural gas, as a substitute for acetylene. The idea is not new and has been tried in England as much as 60 years ago, and it worked fairly well. But it is only very recently that the proper type of torch has been developed which makes the use of city gas and natural gas practicable on an extended commercial scale. As a matter of fact, it is now practicable to use such gases as Propane, Hopane, Shellane, Philfuel, Calol, Pyrofax and so forth. The advantages of using these gases are that they reduce cutting costs very materially and at the same time afford first class results.

The development of new designs in torch construction has markedly improved the efficiency of certain torches when using such gases. All torches, however, do not possess the ability to compete successfully with acetylene. Too often, users have labored under the false impression that the efficiency reposed in the gas itself, when such is not the case. It requires the combination of gas plus proper mixing and combustion. Actually, then, it is a question of using the correct torch in conjunction with the various fuel gases if the most efficient results are to be obtained.

A Harris No. 62 cutter using natural gas and oxygen in the cutting of an 8"x14" steel billet.



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This one-piece 19 inch long chip was drilled from armor plate in a well-known shipyard: hole diameter, 1-9/32"; thickness of armor plate, 2½"; drilling time, 4½ minutes; the drill, a CP 495-165 Hicycle Electric.

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SUMMARY OF TESTS — MATERIAL CUT IN YARD

Torch	Fuel	Cutting Time Hours	Linear Ft. Cut Total	Linear Ft. Cut Per Hr.	Sq. Ins. Cut Total	Sq. Ins. Cut Per Hr.	Cu. Ft. Gas Used Total	Cu. Ft. Gas Used Per Hr.	Cu. Ft. Gas Used Per 100 Sq. Ins.	Cu. Ft. Oxygen Used Total	Cu. Ft. Oxygen Used Per Hr.	Cu. Ft. Oxygen Used Per 100 Sq. Ins.
No. 1	Acty.	45.888	2204.2	50.2	16668	380	1402.2	31.9	8.4	8283.5	188	49.7
No. 2	C. G.	33.24	1708.5	51.4	13376	402	1925.7	57.9	14.39	5852	176	43.7
No. 3	C. G.	14.23	644.4	45.2	4303	302.5	1218.2	85.3	28.3	2364	166	54.9
No. 4	C. G.	25.16	931.	37.0	6173	245.3	1617	64.2	26.2	3236	128.6	52.4
No. 5	C. G.	13.8	628.2	45.5	4367	316.4	1562	113	35.5	3042	220	69.6
No. 6	C. G.	19.3	670.5	34.9	6502	325.0	1371	73.3	24.0	3182	166.5	51.3
No. 7	C. G.	14.8	715.5	48.3	5866	396.5	1385	93.5	23.9	2923	198.0	50.2

A torch has been especially designed for "rivet washing," whereby rivets may be removed at an increased speed of from 100 to 300% over the old method of using an ordinary cutting torch, and without injury to the plate. In addition, the stems of the rivets are left concave so that it is an easy matter to punch them out.

Welding torches are now being used for local heat treatments for hardness, and the "spot" annealing of sheets to provide for deep drawing with presses. A good example of this is the annealing with a torch of a threaded stud before riveting to a flat plate. It was found that cold riveting caused a distortion of the threads so that the nut could not be withdrawn, but that when the end of the stud was heated before riveting, this difficulty was not encountered.

Gas cutting is now done by motor-driven machines at the rate of from three to 60″ per minute on straight lines or any irregular lines. The machine travels on a track while a stylus, following a pre-determined contour line, or template, guides the cutting torch. The most intricate shapes may be cut very quickly in this way, leaving square, soft edges.

Another interesting and useful item of equipment is used for the laying out of pipe joints. With this it is possible to lay out the amount of pipe to be cut for junctions at any angle, and for sizes between two and 12″. It is a time and waste saver.

As regards the use of city gas instead of acetylene, the experience of a prominent Western steel foundry is of much practical interest. This company, by keeping careful records, found that the cost of cutting with acetylene amounts to 55 cents per hour for oxygen and acetylene. It then tried using city gas and found that the cost was reduced to seven cents per hour. The cutting speed was practically unchanged, but the consumption of oxygen was 15 to 20% less, and of course the city gas is much less expensive than acetylene.

One of the outstanding shipbuilding companies of the country made extended tests on the performance of several types of torches with city gas and prepared the table which is reproduced. The first line of the table, it will be seen, gives the figures for acetylene and the next six lines cover the tests with various torches using city gas. It is interesting to note that the performance of No. 2 is decidedly better than any of the others, thus indicating what has already been stated, that it is extremely important to use the right tip. The table also shows that about twice as much city gas is used as acetylene, but as the latter costs much more than double the price of city gas by volume, there is a great saving. The consumption of oxygen is also less than with acetylene and the city gas torch cuts faster. Obviously, the total saving by using city gas is worth considering.

(Pictures courtesy Harris Calorific Co., Cleveland, Ohio.)

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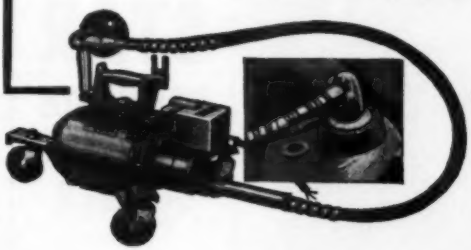
- Fewer Rejects



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MALL 3 H. P., 3-phase Geared Head Unit with Hanger bail mounting.

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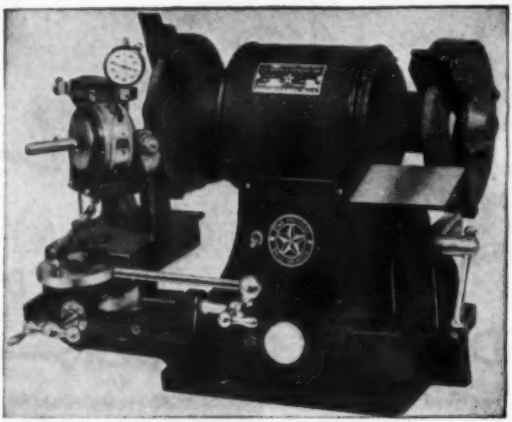

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Precision ground drills cut faster and last longer—do better work and trim production costs. That's the kind of drills you can have with a STAR Precision Drill Grinder.

The STAR produces perfect points on standard twist drills—easily and quickly—without the use of attachments. It is equipped with a precision-made chuck which is adjustable for the entire range specified. Lip angles 29 to 89 degrees are obtained by setting the compound rest at the required reading. Each lip is set for the grind by indicator reading, making it possible to obtain variable clearances behind cutting edges. A zero setting gives a 12 degree clearance behind edge.

Simple to operate—speedy in action—dependable in results, a STAR Precision Drill Grinder will soon pay for itself through the savings which it makes possible.

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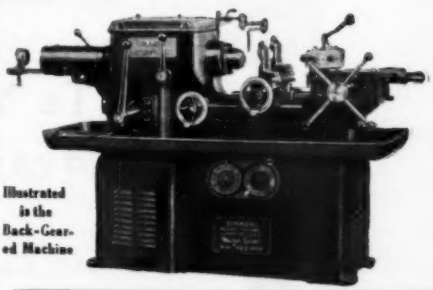
No. 2 TURRET LATHE ▶

This new No. 2 Turret Lathe (1¼" bar capacity) features the Simmons MICRO-SPEED DRIVE, a patented speed-changing device which enables the operator to obtain any of 1,000 spindle speeds by a turn of a handwheel.



Illustrated is the Back-Geared Machine

Among the many satisfied users of the Simmons turret lathe are the Curtiss-Wright Corporation, Fairchild Aircraft Limited, Cessna Aircraft Company and the Sterling Engine Company.

Our production schedules are excellent, but we urge you to write today to insure earliest delivery.

▲ NEW CABINET BASE. *Micro-Speed Drive* offers range of speeds to 1500 RPM. Spindle brake stops and locks the spindles. Selector Dial Control. *Built in plain and back-geared types.*

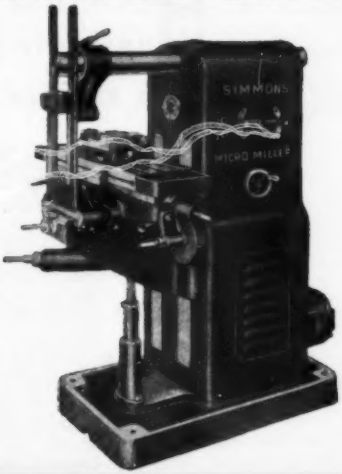
No. A-1 PLAIN MILLER ▶

THIS NEW No. A-1 MILLER is ideal for any plant or shop producing numerous small parts. It is the perfect tool for aircraft use and for all vocational training purposes.

An important feature is the SIMMONS MICRO-SPEED DRIVE, the variable speed unit which has proved so successful in the new Simmons turret screw machines and lathes.

Mounted inside the column, it provides a range of spindle speeds from 38 to 500 RPM at the turn of a handwheel conveniently situated.

Write for Descriptive Bulletin



▶ RANGE OF FEEDS: Longitudinal, 34"; cross, 8"; vertical, 18"; work surface of table, 27"x8".

SIMMONS MACHINE TOOL CORP.

1725 Broadway, Albany, N. Y Singer Bldg., New York City

* * * * * * * * * * * * * * * * *

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Get long, full service thru
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SEVERANCE TOOL COMPANY
1522 East Genesee Avenue
SAGINAW, MICHIGAN

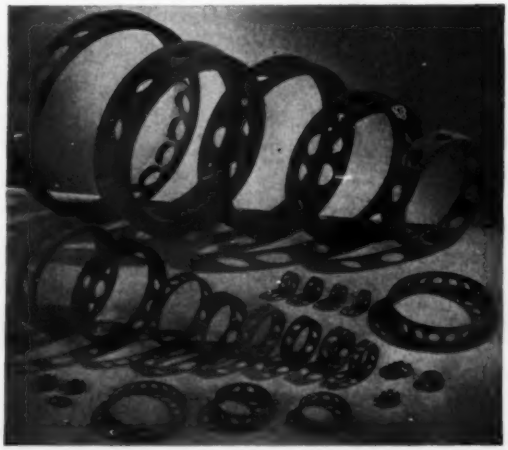
What's New in Plastics

By GEORGE A. FAIRMAN

MANY recent uses for laminated plastics are found in industry. This may be partially accounted for by the shortage of other materials, but only partially. Laminated plastics have many distinct advantages of their own. They weigh, for instance, about half as much as aluminum. They have high dielectric strength, low power factor, low moisture absorption and insulation resistance . . . essential qualities for insulating radio receivers, direction finders and other instruments. Laminated plastics are not only light in weight but they are strong, easy to machine, and they resist the corrosive action of the atmosphere, oils and gasoline. Therefore, they are used for structural parts and for a wide variety of fairleads, guides, spacers, washers and pads.

A few years ago attempts were made to bond sheets of rubber to sheets of laminated plastics. They were successful. Engineers were unusually curious about the "rubber sandwich," as it was called, and the future of the material—because of its dual advantages—looked bright. Yet only recently has it been put to any practical use. Manufacturers of condensers for automobiles use a synthetic rubber-laminated plastic combination for washers, which in service are subjected to oil. The rubber provides the seal, the laminated plastic the strength.

Rubber sandwich material is used for a part subjected to sandblasting.



Various types and sizes of precision machined high-speed ball-bearing retainers of fabric - base laminated tubing.

The rubber outlasts any other material tried because the sand particles rebound rather than cut into the rubber. The laminated plastic to which the rubber is bonded provides the required stiffness and mechanical strength. Other backing materials have been tried but the rubber would not adhere to them satisfactorily.

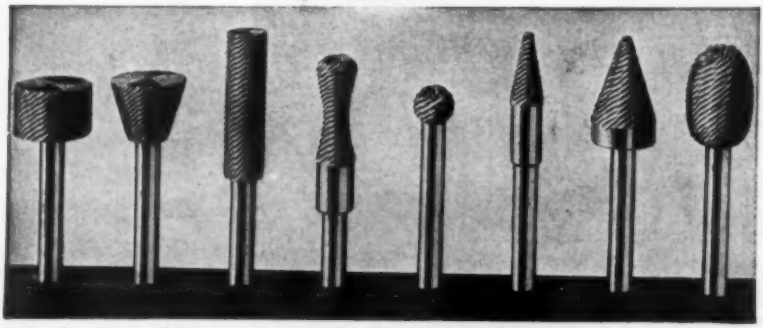
Combination or "sandwich" materials can be used for vibration-absorbing applications. Very likely many new uses for them will be discovered in the future. The combination may be one thickness of rubber and one of plastics or many alternate layers of each. The thickness of the individual layers is optional. The bond is so strong that the rubber usually tears before showing any tendency to delaminate.

Laminated plastics have changed the manufacture of ball bearings for high-speed applications. Many bearing manufacturers now employ retaining rings machined from laminated plastics. The light weight of the material reduces friction and heat and permits much higher bearing speeds. Laminated plastics are not affected by oil or grease, are easy to machine accurately and remain stable dimensionally.

The automotive industry has used laminated plastics for years, principally for timing gears and electrical insulating washers, bushings, and terminal strips. Uses for laminated plastics in automobiles are broadening and increasing. Two excellent and recent examples of wider use are the water pump seal retainer washer and the differential thrust water.

The water pump seal retainer washer satisfies an array of combined specifications. It must bear a thrust load of 40 pounds and a speed of 4,000 r.p.m. The liquid in the cooling system acts as the lubricant, because oil or grease cannot be used. The composition of the cooling liquid naturally varies as widely as the composition of water varies, depending on its origin. In winter the water may also contain alcohol or one of the many anti-freeze solutions. The washer must prevent leakage. Its faces must be lapped parallel and flat to

FORD HAND CUT **ROTARY FILES**



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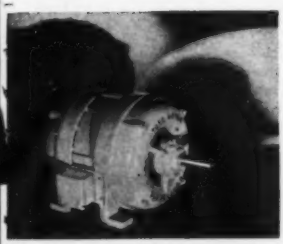
REDUCES OVERHEAD

11,547 machine years of operation for $14.00 in factory repair parts.



TORQ-QUA-MATIC transmissions are powered by sturdy TORQ MOTORS. They are built to NEMA specifications, are completely ball-bearing, highly efficient and built to take punishment. Sizes ¾ to 15 H.P. Deliveries can be made from stock.

TORQ-QUA-MATIC TRANSMISSIONS will reduce your overhead because: (1) they are trouble-free. ½ of 1% of their cost is the average yearly maintenance expense for the drives now in use. (2) they eliminate the shop-wide delays caused when old-fashioned overhead drives break down; (3) these transmissions permit greater, more consistent output with no more effort. This means your overhead per unit produced is actually cut down.

3849 TORQ DRIVES have been operated for 3 years with factory repair parts cost of only $14.00—(and those parts were necessitated by breakage in shipment).

Lower your Overhead, Increase your Production, Obtain greater machine Flexibility . . . Specify TORQ DRIVES! They can be installed, ready to go, in 2 hours.

Next Month: How TORQ-QUA-MATIC can increase your plant efficiency.

THE TORQ ELECTRIC MFG. COMPANY

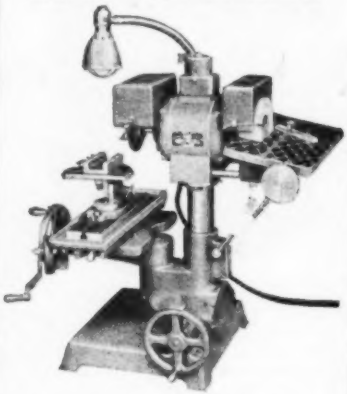
6605 CARNEGIE AVENUE • CLEVELAND, OHIO

eliminate running in. In spite of the many requirements and the severity of the application, laminated plastics have proved superior for the purpose.

The differential thrust washer also brings into play the combined advantages of laminated plastics. This washer functions when one of the rear wheels turns faster than the other, for example, in turning a corner. At such times pressures of 1,000 pounds per square inch or more are produced on the washers in back of the pinion gears. Lubricants, which will withstand this pressure, contain corrosive agents that prevent surface welding. Differential thrust washers made of laminated plastics withstand the high pressures and resist the corrosive action of the lubricants.

(Courtesy—Bakelite Corp., New York.)

EVERY *modern* PLANT *needs* THIS MACHINE



Universal Carbide Tool Grinder

If you employ cemented carbide tipped tools in your plant you will want to know that this machine tool performs all the necessary operations in their upkeep. If you don't—well, excuse us for wasting your time.

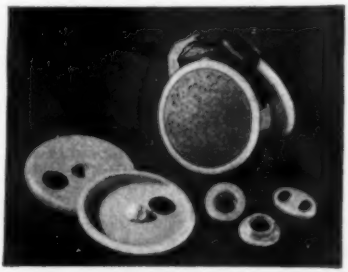
Bulletin CTG40-7H gives you details.

K. O. Lee Company

Aberdeen, South Dakota, U. S. A.

Plastics In Respirators

In response to the Government's appeal for conservation of aluminum, H. S. Cover, South Bend, Ind., manufacturer of Respirators has replaced all aluminum parts with plastics. The new construction is said to offer decided advantages over the old because now the respirator may be completely dismantled for thorough cleaning. A slightly lighter weight, less than 6 ounces, has also been achieved.



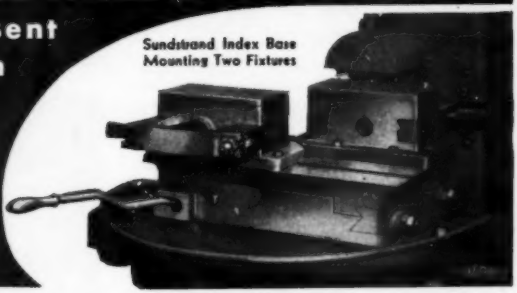
The Dupor No. 24 Respirator has been affected most by the new change-over of materials. Its twin filter retainer plates, (formerly aluminum) are now of ivory-toned plastic. Twin filters are held in place by dust-tight anchor plates that provide 24 sq. in. of clear breathing area. No filter retaining devices needed. Speedy removal or replacement of filters can be made without dismantling unit. Respirator carries U. S. Bureau of Mines approval for type "A" or pneumoconiosis and silicosis producing dusts.

All valves, gromets, screw connections etc., formerly of aluminum are also furnished in moulded plastics; this applies to the entire line of Dupor Respirators. The method of attaching or adjusting the elastic headband has

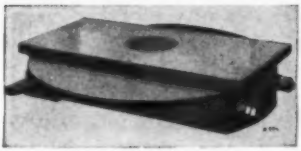
GET MORE MILLING OUTPUT

On Your Present Machines with

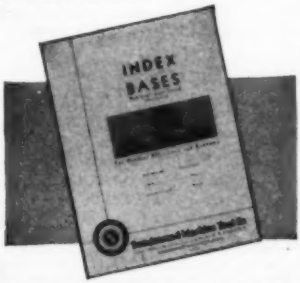
SUNDSTRAND INDEX BASES



Sundstrand Index Base Mounting Two Fixtures



Above: Standard Sundstrand Index Base, with extra detachable chip guards. Bases may also be obtained with operating lever on right hand side, to order.



Bulletin 1B Gives Full Details

Distinctive advantages and full details of Sundstrand Index Bases are described in illustrated Bulletin 1B. Your copy sent promptly upon request.

Accurate . . . Compact . . . Durable

Sundstrand Index Bases in six standard sizes provide convenient, economical means for increasing the output of milling machines and other machine tools. They simplify work-handling; save machine time. Using two or more fixtures on one Base, or machining alternately at two Bases, gives practically continuous operation. Illustration above shows a two-fixture set-up on one Base, with special coolant trough sub-base.

Unusually low and compact; Sundstrand Index Bases have powerful, quick, single-lever clamping. Hardened inserts hold true alignment; give long life in continuous use. Write today for Index Base Bulletin No. 1B, and ask for name of nearest dealer.

DEALERS — Shops everywhere need Sundstrand Index Bases, Balancing Tools, and Bench Centers, to speed up operations. Improve your service to customers and increase profitable sales with these high-grade, big value Sundstrand Open Line Tools. Investigate.

SUNDSTRAND MACHINE TOOL CO.

2535 Eleventh St., Rockford, Illinois, U. S. A.

RIGIDMILS - STUB LATHES

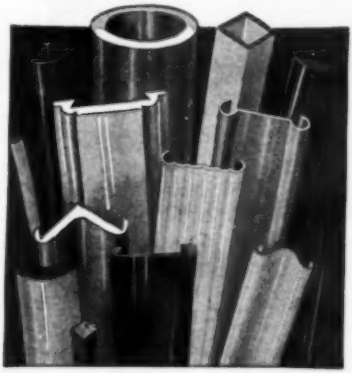
Tool Grinders - Drilling and Centering Machines

Hydraulic Operating Equipment - Special Machinery

also been re-designed. New clip-on devices now replace old construction and handy slide fasteners are provided for adjusting band to any head size.

Extruded Plastics

The Chicago Extruded Plastics Co. announces improved methods and facilities to extrude plastics in continuous lengths and innumerable cross-sectional patterns. The products include flexible plastic conduit tubing and shapes now finding many uses in industry because of toughness, high tensile strength, dielectric properties, resistance to pressure, impact and torsion. This firm will specialize in the extrusion of industrial plastics that are impervious to gasoline, oils and other organic substances, and in structural



and decorative plastics in standard and special shapes ... moldings, trim, threads, etc., which are available in an unlimited number of colors and degrees of opacity. Among the advantages claimed is exceedingly low die cost.

Processing Koroseal

Development of a method of processing Koroseal—the synthetic thermoplastic material—into a transparent and highly durable film with wide industrial application, was announced recently by the B. F. Goodrich Co.

The film development is the seventh major product field invaded by Koro-

GRIT-CUT
ABRASIVE CUTTER

Designed for tool rooms. Can be utilized for light production. Two convenient sizes for mounting on bench. Legs supplied at an extra cost. An inexpensive cutter costing only

$140.00

Does quick and accurate cutting at minimum cost. No job too hard for Grit-Cut.

For quick repairs the cartridge type spindle can be removed and assembled spindle substituted.

The No. 6 machine capacity is 1" solid or 1¼" tubing. Size of wheel is 6". Motor is ¾ h.p., 3450 R.P.M. Spindle speed 10,000.

Let us send you complete details.

TUBE METHODS, INC.
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"PENCILPOINT" DIAMONDS
for Truing Grinding Wheels

A hard natural point (not cut). A long, slender diamond to be used up without resetting. Toolmakers prefer them. $1.50 each; $1.20 each for 10; discounts in quantities.

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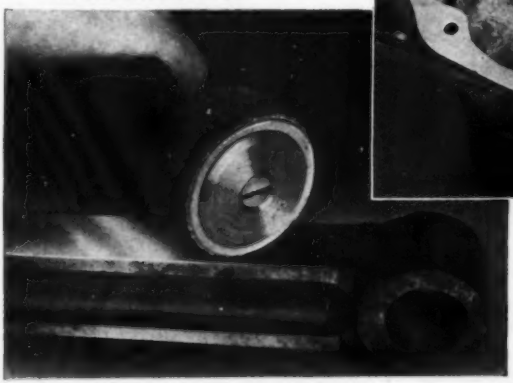
FLEXIBLE SHAFTS, EQUIPMENT AND TOOLS

For finishing aircraft engine parts: rotary filing, polishing, sanding, buffing and grinding.

FILING A CYLINDER HEAD

SANDING AND POLISHING A CONNECTING ROD

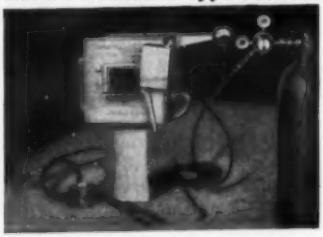


THE CHAS. L. JARVIS CO.

MIDDLETOWN, CONN.

CHICAGO BRANCH OFFICE AND STOCK 1344 W. WASHINGTON BLVD.

"Stark"
"ELECTROBLAST"
No. 2 Full Muffle Type Furnace



High grade insulated Furnace. Silicon Carbide Muffle 7"x4⅝"x3½". Complete with built in blower ready to run, $138. Blast actuated by powerful Universal ball bearing motor. May be had as a Hydrogen Brazing Furnace complete with Pyrometer as illustrated, $266. Unit will reach 2350°F. in less than an hour at 10c per hour. Indispensable for small intermittent jobs. Write for descriptive literature.

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Originators of the American Bench Lathe
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HIGH SPEED
Production Riveting

A great help in Defense Production, these Grant Riveters are available in Noiseless Spinning and Vibrating Hammer types—also Vertical and Horizontal Multiple spindle Spinning Machines.

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The Grant Mfg. & Machine Co.
C. E. STATION
BRIDGEPORT, CONN.

seal, the synthetic created from limestone, coke and salt, and climaxes five years of experimentation.

Koroseal film is claimed to be resistant to outside exposure—sun, oxygen, and extremes and changes of temperature. In addition, the new film is extremely water and moisture-resistant.

Glass-clear and highly flexible, the film is now being produced in gauges ranging from one-thousandth of an inch and up. It is made in a variety of colors in transparent, sem-transparent, translucent and opaque forms.

While the chief uses are in waterproofing and packaging materials, its chemical inertness, flame resistance, and electrical properties make it valuable for laminating chemical containers for holding acids and corrosives and for insulating fine electric wire and cable. Other more obvious adaptations are for rain-wear garments of all kinds.

Other processing fields invaded successfully by Koroseal are:—the treating of fabrics and materials to form waterproof garments; extruded goods such as hose, tubing, electric wire and cable insulation and strip material for belts; molded gaskets, grommets and other goods; special cements; acid and weather-resisting paints; and Korogel for making flexible molds.

"Made to Break!"

Black, Sivalls & Bryson, Inc., is in the business of manufacturing safety heads for pressure equipment, and the heads must fail at the proper time. These heads are designed so that they will blow off or fail as soon as pressure within an enclosed vessel reaches a predetermined point. If these pressure discs should become corroded, or should they be fabricated from inferior materials, they might burst inopportunely.

A safety head diaphragm, or rupture disc, should burst within 5% of its specified pressure, not when it pleases. Otherwise, overpressure may damage the vessel.

Since the safety head has no moving parts to stick, no narrow passages to plug up, no adjustment to screw down and increase its opening pressure, when the pressure builds up to the ultimate

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Tells how WET-DRY BELT GRINDING Relieves Big Machines on Many Operations!

● Get this FREE new book—tells you how Wet & Dry Belt Grinding replaces or supplements operations normally done on millers, surface grinders, disc grinders, trimming cutters, etc. Learn how this latest grinding method saves set-up time on countless jobs, cuts faster and is cheaper to do. Read about its superiority over other methods for grinding "locating" surfaces, facing or leveling, cleaning and polishing castings, removing burrs, smoothing off flashings and gates. See how you can use this process on metal, plastics, soft alloys, stainless steel, rubber, etc. The most timely, helpful book in the machinery field. Limited edition just off the press. Send coupon for your FREE copy *today!*

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Please send me my FREE copy of "Wet-Dry Grinding in the Spotlight".

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strength, or bursting pressure, of the rupture member, it simply has to burst. So there is no problem in making a pressure rupture disc that will burst at a certain pressure—when it is new.

The safety head must have a long life, yet it must stand up under the abuse of pressure, exposure to weather, or to the attack of corrosive chemicals—for months, for years, until the day when its rupture diaphragm may be called upon to burst at its original specified pressure to prevent explosion of the pressure vessel it protects.

Many safety heads are used in such corrosive atmospheres that the thin metal rupture member must be provided with a film of protection by coating it with heat-reactive phenolic varnish.

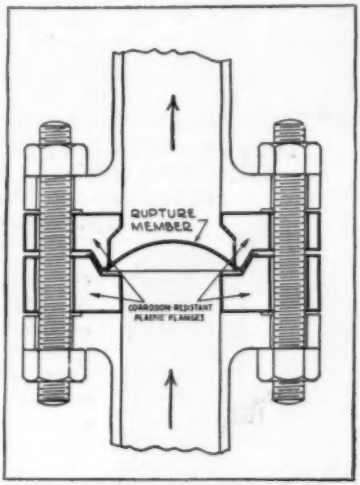

Diagram illustrates how corrosion-resistant plastic insert flanges are used on larger sized safety heads.

The safety head flanges that hold the rupture member must also be made of corrosion-resistant material. Again a laminated plastic material solves the problem. In small sizes and low pressures the entire safety head flanges, with inlet and outlet threaded for iron

MODEL NO. 16 "SPECIAL"

Constructed as per Specifications of U. S. Naval Aircraft Factories

Reg. U. S. Pat. Off.

Beware of Imitations! Our machine carries the Butterfly trade mark.

BUTTERFLY FILING and SAWING MACHINE

(Die Making Machine)

This is a very heavy, powerful machine and is designed for extra heavy filing and sawing, but it performs small work just as well. This type of machine is usually adopted in Ammunition Plants, Airplane Factories and machine shops where heavy and precision filing and sawing is desired. We also manufacture smaller models—Model D-10" Table; Model No. L—12" Table.

HARVEY MANUFACTURING CORP.
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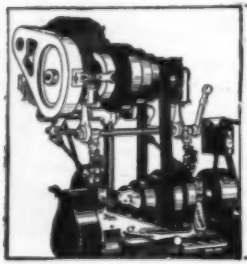


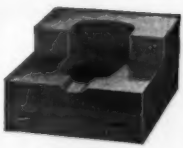
Cuts Cost In Half!

Remco Motor Drives deliver power when, and where, it is needed. Show tremendous production increases, with power savings up to 50%. Eliminate costly maintenance of shafting, pulleys, clutches and belting. Improve lighting! Increase safety! Reduce noise! Save floor space! Low installation cost! Investigate—write! Remco Products Corp., State St. at R. R., York, Pa.

REMCO MOTOR DRIVES
for LATHES, SHAPERS, DRILLS, MILLING MACHINES, etc.

HOW TO INCREASE PRODUCTION NOW

. . . WITH A TRACER HEAD ON YOUR GORTON VERTICAL MILL



Owners of Gorton Super-Speed Mills convert the plain miller into a double purpose machine—capable of making parts, as well as sinking dies, or doing other milling operations—by adding a Gorton Duplicator Tracer Head.

SIMPLE TO ATTACH—Within 1 to 2 hours, the duplicating Tracer Head may be added to any Gorton Mill built since 1935. Once attached, this head need never be removed. You are always ready to do either simple duplicating work, or vertical milling, whichever is needed.

With this head, even a comparatively inexperienced operator can duplicate parts quickly and accurately by utilizing the machine feed screws, with the Tracer as a guide.

QUICK DELIVERY—Gorton Duplicator Tracer Heads can be delivered within 45 days from receipt of order.

FREE ENGINEERING SERVICE—If you have any problem of duplication, send us full data on the parts. Our engineering department will be glad to study your jobs and make recommendations—no cost or obligation.

GORTON

GEORGE GORTON MACHINE CO.

1317 RACINE STREET, RACINE, WISCONSIN, U. S. A.

HART'S MILLING FIXTURES

These fixtures will make themselves popular and profitable in your shop. They are easily kept clean to receive the work and may be used in either horizontal or vertical position. Suitable to hold round, hexagonal, octagonal, or square stock, aligning the work with the machine. A very easy setup and fool proof, with a grip that holds the work on the bottom as well as on the back. Shipped in pairs, unless otherwise ordered. Made in 4 sizes—¾" to 4". **We can also supply dividing heads to be used with the fixtures.**

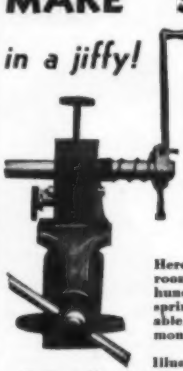
Write for descriptive circular.

Kindly Mention the Blue Book

HART MACHINE CO.

26 Mather St., Dorchester, Boston, Mass.

MAKE SPRINGS *with* **Blaner Universal Hand SPRING WINDER** *in a jiffy!*



Here's a profitable tool room unit. Quickly makes hundreds of sizes of springs. Sturdy, dependable . . . a real time and money-saver.

Illustrated is No. 4 Universal with adjusting shaft of 5/8" square. Takes wire up to 1/4" diam.

Patent No. 2052443

Write for your Circular.

THE JOHN BLANER CO.

Corner Meek & Elm, Sharon, Pa.

pipe or copper tubing connections, is made of fabric-base laminated material produced from "Bakelite" laminating varnish. A small safety head with laminated flanges and varnish "plated" rupture member is illustrated.

Bursting pressure of this safety head diaphragm protected with "Bakelite" resin base varnish is 250 lbs.

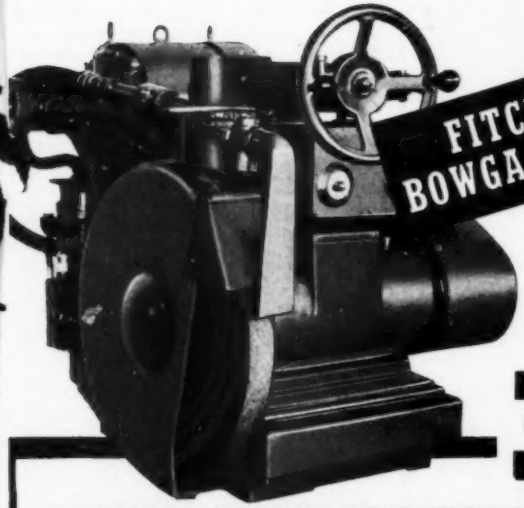
The diagram shows how corrosion-proof plastic "insert" flanges are used in larger sizes. This application is particularly important now, with many types of corrosion-resistant metals and alloys obtainable only for defense equipment.

(Photos and story—Courtesy, Bakelite Corp., New York.)

Protective Transparent Gloves

Long-service gloves of Resistoflex PVA were developed expressly to prevent oils and solvents from coming into contact with the skin. Where they have been used, they have been effective in eliminating such widely prevalent occupational diseases as folliculitis and dermatitis - or even more serious toxicity.

For example, in many metal-working industries such as aircraft manufacturing, production of screw-machine products, etc., the machine operators are exposed to substantial amounts of in-



33 1/3%
FASTER THAN PREVIOUS GRINDERS

Chicago sources report that Fitchburg Bowgage Grinding wheelheads have speeded up operations on outboard motor parts 33⅓% over grinders previously used.

You too can save time and money by replacing conventional type grinding wheelheads with standard Fitchburg Bowgage units. They fit your present bases, or they can be adapted, on special mounts, for automatic multiple grinding of precision work in mass production. Easy to remount for other jobs, rapid and simple in operation, they use a new application of familiar mechanical principles to increase accuracy of feed control.

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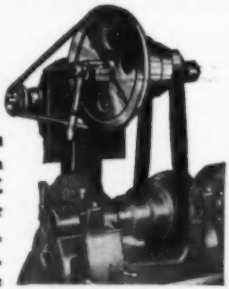

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soluble, sulphur-base cutting oils. The gloves provide complete protection. Similar immunity is gained by workers where protection is needed against petroleum or naphtha solvents, carbon tetrachloride, trichlorethylene, perchlorethylene, benzol, ether, chloroform, ethylene dichloride or mixtures of any of these.

Containing no sulphur, the gloves cause no tarnishing of metal surfaces they touch. Inspectors use them to advantage in handling finely polished metallic surfaces - ball bearings, aircraft parts, etc. Resistoflex Corp., Belleville, N. J. are the manufacturers.

Open New "Thiokol" Unit

To take care of the constantly spiraling need for oil-proof synthetic rubber, Thiokol Corp., and the Dow Chemical Co., have opened for production a new plant in Midland, Mich.

The new plant is understood to have a capacity of more than 150,000 pounds per month, which together with other Thiokol plants now operating and planned will turn out 6,000,000 pounds of synthetic rubber annually, as compared with an annual output of 4,000 pounds during 1930, the first year in which this synthetic rubber was made.

Though the national defense program has focused attention on those qualities of synthetic rubber vital for

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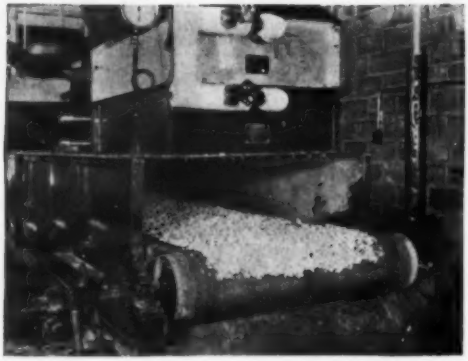

Pellets of synthetic rubber, leaving a conveyor belt at the Thiokol plant. Made of such raw materials as salt, gas, and sulphur, all readily available in U. S., Thiokol can be produced in volume sufficient for our strategic rubber needs in event of a Far East blockage, Company officials state.

the production of armaments, it should be realized that Thiokol, from the time it first appeared in 1929, has had a constantly increasing number of commercial applications.

Thiokol has been responsible for many revolutionary changes in the construction of such articles as gasoline service station hose, fuel oil hose, seals and gaskets for every type of industrial equipment, automotive parts, printing press rollers, and many other rubber or part-rubber products required to function in the presence of oil, gasoline, alkalis, acids and other solvents and chemicals.

Swiss Pattern File Catalog

A particularly informative catalog on American Swiss (Swiss Pattern) Files has been published by the American Swiss File & Tool Co., 410 Trumbull St., Elizabeth, N. J.,

The introductory pages describe the origin of American-made Swiss Pattern Files, explain how these files are manufactured, illustrate different cuts, as well as comparative cuts, of Swiss Pattern and American or commercial pattern files, and include suggestions for the selection, use and care of files, to obtain best results.

More than 3,000 different shapes, cuts and sizes of American Swiss (Swiss Pattern) Files are listed in the catalog, together with description and illustrations of each shape and explanations of their use.

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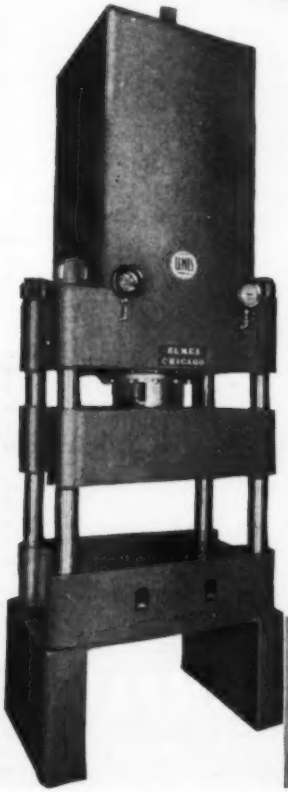

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Hardening Cylinder Liners

By PAUL ANDERSON

APPLICATION of induction heat treatment to the bores of cast iron cylinder liners used in all their diesel tractors has been announced by Caterpillar Tractor. This is said to be the first 100% production application of electro-magnetic heating to the cylinder bores of internal combustion engines, and is an adaptation of an interesting process developed by the Budd Wheel Co. of Detroit.

The treatment produces an inside diameter surface of controlled hardness, depth, and area in the bore of the liner, resulting in a longer - wearing sleeve with markedly improved physical properties, it is claimed.

In this installation the heat treating machine hardens the inside diameters of the cast iron liners to a surface hardness of Rockwell "C" 52-55, which is subsequently tempered to a slightly lower hardness. Depth of the hardened area developed is approximately .070". Liners from 10 to 15" in length, with bores varying from 3¾ to 5¾" I. D. are in production. Following the operation of hardening and tempering, the bores are honed to the final finish before "Surfiding," after which the O. D. is finish-turned for insertion into the cylinder blocks.

The finished sleeve is reported to be superior in wear-resistance and other physical characteristics to any which have been previously produced. While the bores are extremely hard, providing maximum resistance to wear, the sleeves are not brittle. It is asserted that quality and uniformity of product are maintained at high standards.

How the Process Works

Differential hardening by electro-magnetic induction is accomplished through the concentration of high power, high frequency currents in the surface zone to be hardened. As applied in the Budd method of hardening the inside diameters of cylindrical ob-

Placing a Diesel cylinder sleeve in the induction heat treating machine.

End view of Diesel cylinder liner. Note the hardened zone, which is approximately .07" deep, showing in the slots milled in after hardening.

jects, the currents are caused to flow almost entirely in the shallow internal surface zone to be heated. They are so concentrated that the temperature of the zone affected is raised to hardening temperature before any substantial amount of heat can drift to the remainder of the piece.

In this way, the required heat is almost instantaneously generated in the zone to be hardened. This thermal energy is then "trapped" through the immediate application of a controlled water quench. An extremely hard surface is thus obtained, while the remainder of the cylinder has remained relatively cool.

As the power input and timing of the current application, and the volume, pressure, and angle of direction of the quench are accurately controlled, it follows that the hardness developed, depth of the hardened area, and the area treated are also controlled within remarkably close limits. The time required for the entire heating and quenching operation is a matter of but a few seconds.

This development of the induction method of heat treating inside diameters was undertaken with a specific aim in mind. It had long been recognized that if the bore of a cylindrical object could be hardened, while the remainder of the part was held in an undisturbed and machinable condition, the entire manufacturing operation would be simplified. This having been achieved, improved physical characteristics would naturally result; for example, greater resistance to bursting or collapse would follow if this metallurgical condition could be attained.

It was also hoped that a wider range of materials, including non-alloyed ferrous metals as well as the alloyed, could be satisfactorily treated. It is claimed that all of these advantages have been realized. Composite heat treatment is also possible. A tube which has been heat treated throughout may be "kissed" on its I. D. by the heat treating head to produce a harder interior surface.

High speed of production is another advantage. The first successful application of the process was to the bore of automobile hubs, in which a section of the I. D. was hardened to form a roller bearing race. In this work induction is hardening the I. D.

BOTTOM OR THRU HOLE TAPPING WITH THE SAME CHASERS

The bottom hole tapping jobs won't find you without chasers when you have the new MODERN Style A Collapsible Tap. That's because you don't need special chasers for bottom hole tapping with the MODERN Collapsible Tap. The body of the MODERN Collapsible Tap is made in one piece. No end plate is necessary and standard chasers extend beyond the face of the tap body.

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6 point selective switch on all floor models allows for quality welds on various materials. Standard and Underwriters Labeled Machines.

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Bench models 2½ to 10 KVA—with or without pedestal.

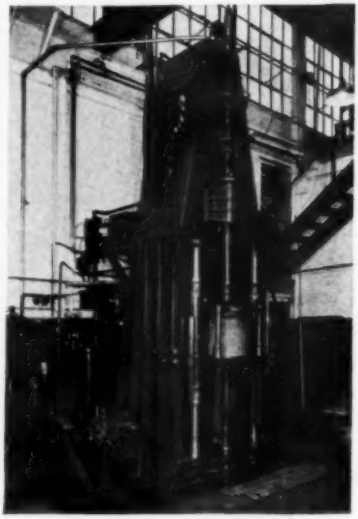
Few Territories Available.

The Topeka Foundry & Iron Works Co.
300-332 Jackson St., Topeka, Kansas

of three to four hubs per minute per machine.

Some Details of the Machine

The operation is accomplished through the use of a carefully engineered induction heat "head" which is drawn evenly through the bore under treatment, or conversely the part is drawn progressively over the heat "head." As this head travels through the bore, a high frequency current is applied, causing magnetic lines of force under treatment. This operation is followed immediately by the controlled water quench.



Research induction heat treating machine in the Budd laboratories in Detroit.

Operation Is Automatic

The movement of the head, application of the current, and operation of the quench are all entirely automatic, removing any possibility of error in the process once the machine has been set for a particular operation.

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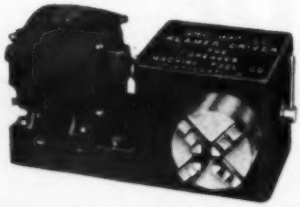

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The machine is unusually flexible, and is carefully designed for rapid changeover. It is compact enough to be placed directly in a production line.

"Tailoring" Cylinders

The process makes possible the production of improved units in nearly every type of machine in which cylindrical metal bores are subject to wear or stress. Hardness is produced at points of greatest wear, while a tough, ductile core is retained to provide maximum strength. Physicals of the parts treated are, in effect, "tailored" to fit wear and strength requirements. Further, where design permits, the outside diameter, and all other unhardened areas, can be machined after heat treatment of the inside diameter of the bore.

Some Metallurgical Results

In materials containing temper or uncombined carbon, recombinations of this carbon at a greatly accelerated rate can be accomplished through this method of induction heat treatment, thus markedly increasing the "hardenability" and strength of the area treated. The grain size of the treated material may be made consistently smaller. This is an advantage in most applications for improved properties can be developed in this manner.

Welding Award Information

The James F. Lincoln Arc Welding Foundation, Cleveland, Ohio, announces a periodical to furnish information to men who are interested in the $200,000 Industrial Progress Award Program.

The first issue of "Aspiration," as it is called, emphasizes that one does not need to be a welding expert to compete. An occupational breakdown of previous winners shows that only 5.3% were directly connected with welding. It is not necessary that your plant use welding. A design, together with a description of the design, makes an eligible paper.

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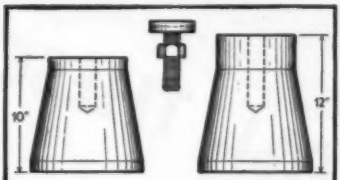

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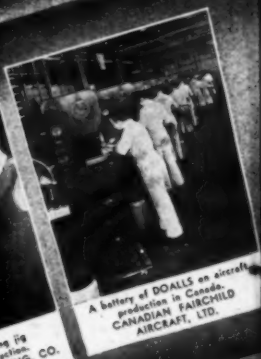
Here's the DO-ALL making jig parts for small arms production. CONNECTICUT TOOL AND ENG. CO.



A battery of DO-ALLS on aircraft production in Canada. CANADIAN FAIRCHILD AIRCRAFT, LTD.

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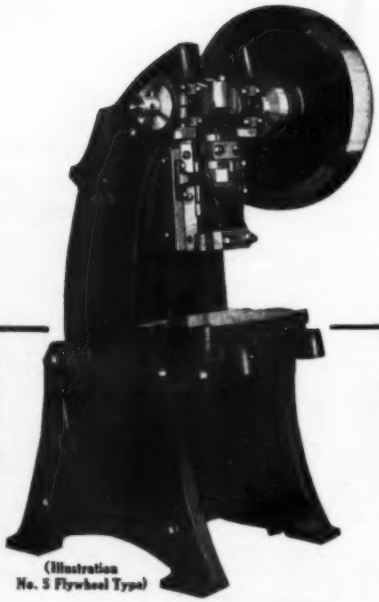

(Illustration
No. 5 Flywheel Type)

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Broaching Carburetor Bodies

TWO unusual broaching operations, widely different in purpose and character are now being performed at the Milford, Mich., Ford plant.

Both are performed on the cast iron throttle body of the carburetor, which is of dual downdraft type. A press type of colonial broaching machine is used to "snag" flash from the outermost ends of throttle body previous to first machining operation. This was formerly done by hand snagging, which made it necessary to locate part for the first machining operation from the rough surface of the casting. By broaching, a finished pair of surfaces to close dimensions is now provided.

The amount of metal removed, including flash, ranges from 0.015 to 0.060". The productive rate, tremendously increased compared with the former hand snagging method, averages nine per minute or 540 per hour.

In the second application, broaching was used to solve a peculiar problem having a direct bearing upon the performance of the carburetor. To obtain uniform distribution of fuel-mixture to all cylinders of V-type engines, absolutely identical diameters of the two holes through which the mixture passes are required. A variation of as much as 0.0002" between the holes is considered enough to alter the accuracy of mixture distribution beyond required limits.

Preliminary tests showed that no matter how accurate two separate broaches were or how accurately the

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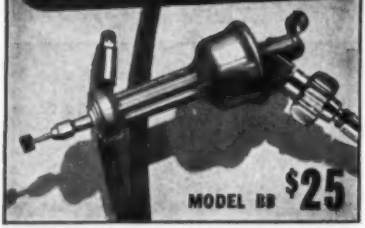
TOOL ROOM
PRODUCTION



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207 WAUBESA ST., MADISON, WIS., U.S.A.

parts were held in a fixture, the allowable variation between the holes was exceeded. Only by using the same broach for both holes could they be held within 0.0002" of one another. A larger variation between different throttle bodies was permissible however, since adjustments could be made in manufacture of other parts.

The broaching machine carries two broaches so that two holes are broached simultaneously, but in two different throttle bodies. The same broach machines both holes in the same throttle body merely by providing a means of relocating each part in two positions on platen of machine. The operator repositions each part once in each pass of the broaches. One part is thus broached for each pass. Productive rate averages 250 pieces per hour.

In this operation a Colonial pull down type broaching machine of 4 tons capacity and 24" stroke is used. To maintain accuracy as to size, broach is of the built up type, consisting of a series of high speed steel half sleeves for rough and semi-finish cutting and four tungsten carbide rings for final sizing. Reason for using carbide rings, of course, is the vastly lower rate of wear of this material and consequent maintenance of correct size in production. Effective cutting length is 8", overall 20". The holes are finish broached following a rough reaming operation. Rough finish dimension is 1.244", finished size 1.250".

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"We have three of your band saws in our foundry" says one plant manager (name on request). "We use them for sawing gates on our brass and aluminum castings. We figure that we save at least 60% on our trimming costs by the use of these machines, due to their low first cost, their low upkeep, their small blade cost and long blade life. We don't know where we would find a machine that is so useful!"

Widely Used for Many Jobs

This Delta metel-cutting band saw is being used for cutting aluminum castings and sheets, hard and soft cast brass, brass sheets and tubing, cast iron, copper, cold rolled steel, carbon tool steel, bronze and manganese, drill rod, high speed steel, monel metal, nickel steel, iron sheets and bars, malleable iron, babbitt, bakelite and other types of molded plastics, asbestos, slate, transite, pipe and countless other materials too numerous to mention. It cuts everything from cast-iron jig and fixture bases 1½" and 2" thick to draw die segments 6" thick.

Efficient 14" Delta Wood-Cutting Band Saw

There is also available in the Delta line an unusually efficient 14" wood cutting band saw—incorporating many unusual features. It offers many advantages over other machines. See the Delta Catalog for details and prices.

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Send coupon for latest Delta Catalog and special Band Saw Circular giving full details and specifications.

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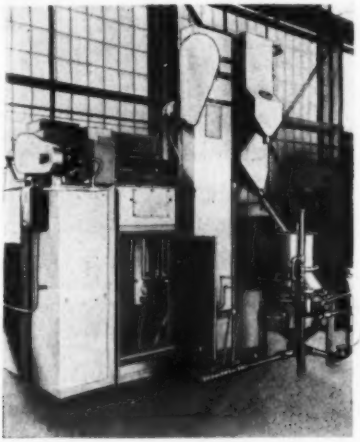
4305 W. 24TH PL., CHICAGO, ILLINOIS U.S.A.

Cleaning Shells

OF all the problems involved in shell production, the cleaning operation is particularly important. Heretofore this process has generally been slow, often inefficient, and always relatively expensive.

Shell blasting machines, such as used during and since the first World War have two correct features in their design:

1. The open end of the shell is down so that rebounding abrasive escapes quickly and does not act as a damper on newly discharged abrasive.



View of rear of shell blasting machine showing access door and continuous tank arrangement.

2. The shell is rotated while being blasted, so that a nozzle aimed at the side wall cleans all the way around the interior circumference.

New equipment designed by American Foundry Equipment Co. offers these added features:

1. The new design is arranged so that the blast nozzles are never shut off. This eliminates lost nozzle efficiency when starting up or shutting down.

2. Conveyor timing is incorporated in the new design.

3. The shells are successively indexed over three nozzles aimed at different points on the interior of the shell, so that the entire interior surface is struck by abrasive on the initial discharge from the nozzle. (The old designs depended upon rebound to a large extent—using only one nozzle per shell).

4. The new design permits the addition of auxiliary equipment to clean the outside of the shell in cases where manufacturers wanted to eliminate the exterior scale in order to save expensive tools.

The new shell cleaning equipment cleans the interior of shells by air pressure, using air blast nozzles, because of the small openings in the ends of the shells. However, the cabinet is designed so that an airless Wheelabrator unit can be added as auxiliary equipment for cleaning the exteriors of the shells. Many customers have found it desirable to do this, because the re-

Shell Size	Nozzles at 90 lbs.	Production Per Hour	Air Required Allowing 1/16" Nozzle Wear
60 mm.	five 5/16"	720	725 to 1050 C. F. M.
75 or	three ⅜"	180	630 to 855 C. F. M.
90 mm.	three 7/16"	250	855 to 1125 C. F. M.
	three ⅜"	135	630 to 855 C. F. M.
105 mm.	three 7/16"	200	855 to 1125 C. F. M.
	three ⅜"	100	630 to 855 C. F. M.
5" AA	three 7/16"	150	855 to 1125 C. F. M.
	three ⅜"	60	630 to 855 C. F. M.
155 mm.	three 7/16"	80	855 to 1125 C. F. M.

moval of scale from the shell greatly extends the life of expensive carbide tools.

The new design incorporated in this equipment is claimed to reduce by one-half the amount of compressed air previously required for a given production. As compressed air is the most expensive requirement in all pressure blast operations, the new design results in substantial savings in initial investment and in operating costs.

A description of several installations gives a better picture of the performance this equipment is giving:

The Delaware Ordnance Depot at Pedricktown, N. J., handles shells for reloading only. The machine cleans 5,000—75 mm. shells every 24 hours, and the operating time is 20 hours per day, so the average rate of production is 250—75 mm. shells per hour. Only two 5/16" nozzles are used, so the compressed air requirement is 290 to 420 C. F. M.

Loading device in elevated poistion as shell is placed in or removed from hanger.

Auto Specialties Mfg. Co., St. Joseph, Mich., uses a light duty machine of the same general type. It is designed to clean small cast steel shells up to three inches in size. This unit is cleaning 720—60 mm. shells per hour. It uses five 5/16" nozzles, so the air requirement is from 725 to 1050 C.F.M.

Based on careful tests on the machines in the field, and by similar tests at the factory, the maker offers the tabulated guarantees on production.

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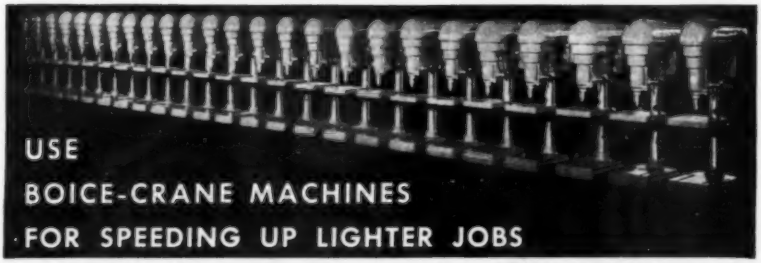

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* Dependable delivery on Boice-Crane tools —often only a matter of days—never over a few weeks. Why wait 6 to 12 long months for big, heavy, costly tools that never can handle light jobs as efficiently anyway? Oughtn't you get our literature too and start tooling more light drilling, tapping, and cutting jobs this quicker, cheaper way?

Folder No. 1 lists over 60 Boice-Crane Drill Presses to 5/8" and Tappers to 1/2" capacity. No. 2 covers our 8-Speed All-Purpose Band Saws.

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The most logical thing in today's forced production is to use your large, hard-to-replace machines on large operations only. Load the smaller jobs on lighter, speedier, less costly AND easier-to-get Boice-Cranes, and the benefits double up. You not only get more out of your big machine—you also get the EXTRA saving of running the lighter jobs at reduced cost on a machine designed specially for that class of work.

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A Releasing Model Acorn Type Die Holder with Adjustable Concentric Alignment for Hand Screw Machines and Turret Lathes.

★

The spontaneous acceptance of the ALCO acorn type die holder for *automatic* screw machines prompted us to introduce this type of tool in the releasing model for *hand* screw machines.

- ★ **Adjustable concentric alignment.**
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- ★ **Produces perfect work in worn, old machines.**
- ★ **Assures alignment of die regardless of thread fit.**
- ★ **Quick, simple set-up positively concentric with work.**
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ALCO EFFICIENT TOOLS

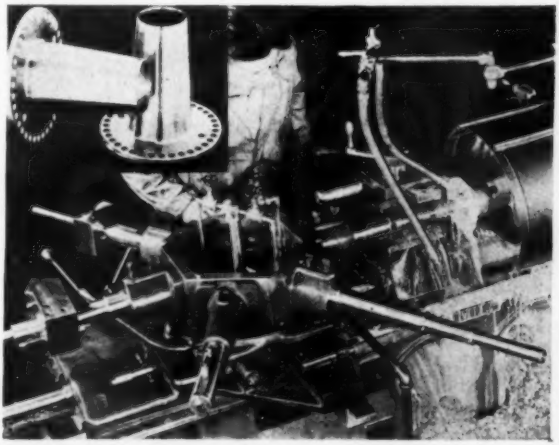
Speeding Production of Propeller Parts

ACCURATE and smooth machining of three different types of variable pitch airplane propeller bronze bushings complete except for bolt holes in two operations totaling 18 minutes is now being accomplished on high-production turret lathes equipped with tungsten carbide tools. It is emphasized that the very close tolerances specified, combined with the nature of the service and of the material—Ampco No. 18 high wear-resisting bronze—presented a difficult machining problem and required utmost care in processing these parts.

Gisholt turret lathes are used for both operations. The set-up for the first operation, requiring 12 minutes floor-to-floor time, is shown in the illustration. After mounting in a 3-jaw scroll chuck, using center on cross-feeding hexagon turret, the sequence of steps is:—The larger of two internal diameters is rough bored; the hole of the part is rough - chamfered with an end bar and at the same time the flange is straddle-faced by Carboloy tools mounted in the square turret. The smaller of the two internal diameters and the larger diameter are next semi-finished with a piloted boring bar. Both internal diameters are then finished, as are the two faces of the flange. Next the internal taper between the bores is rough-formed, the chamfer is semi-finished, the flange diameter is turned and the chamfer finished. Finally the internal taper is finished with the square turret tool post and side carriage taper attachment and outer corners of the flange are chamfered.

In the second operation, the outside of tapered hub is turned, using the cross-feeding hexagon turret with taper attachment. The base of the taper at the flange is then turned and the end is faced with the square turret tool post. The floor-to-floor time for this operation is 6 minutes.

During the various steps in both operations the feed is maintained at 0.015 in. The depth of cut ranges from 1/8th to 3/16" and the cutting speed is from 250 to 400 ft. per min. All three types of bushings, which require similar precision and finish, are machined in approximately the same time. The type for which the foregoing operations are given is shown by the insert in the illustration.



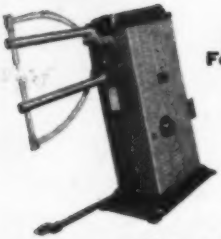
(Photo—Courtesy Gisholt Machine Co., Madison, Wis.)

REX

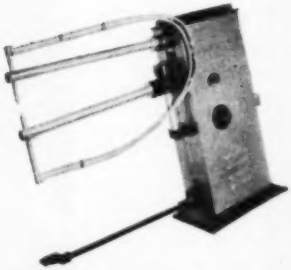
Heavy Duty SPOT WELDERS

Press Type
Foot Operated

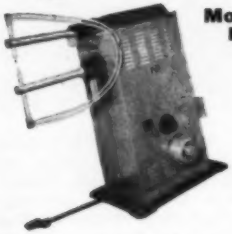
Rocker Arm
Air Operated



Rocker Arm
Foot Operated



Foot Operated
Swivel Lower Arm



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Made of the marvelous new V/T Super Bond that is causing a sensation wherever tried. Chicago Mounted Wheels actually give 150% to 300% longer life, hold their shape and grind more pieces per wheel faster and without sacrifice to cutting action.

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FOR PRECISION WORK

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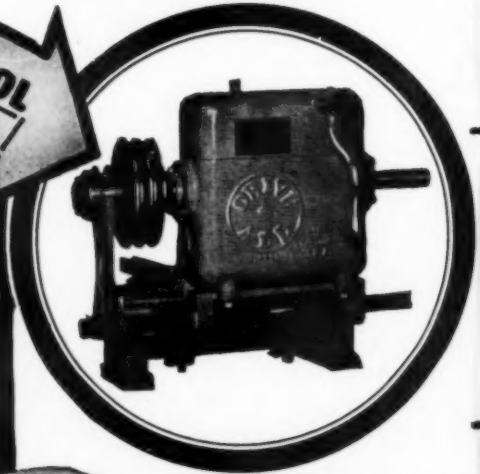

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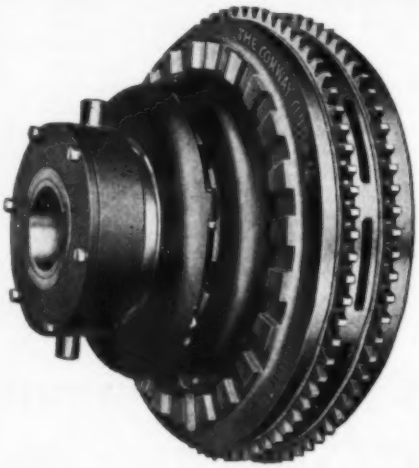

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Have you our bulletins XYZ-L, P-24, MGT and L-29 on Disc Clutches, S-10 on Overload Release and Slip Clutches, 36A on Compression Clutches, K-32 on One-Revolution Clutches, and E-8 on Expansion Clutches?

The Conway Clutch Company

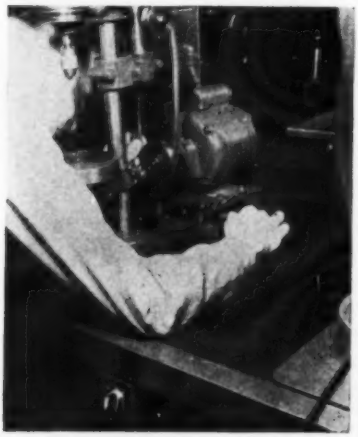
1541 Queen City Ave., Cincinnati, Ohio

"Let's Talk Shop!"

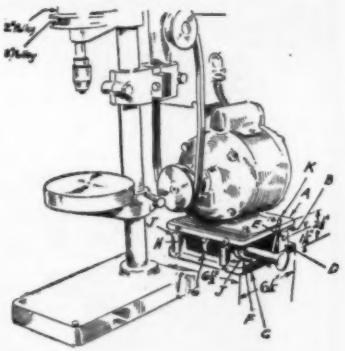
Adjustable Motor Base

By Irving B. Lueth

A ¼-hp. G. E. capacitor-start motor is used to operate the bench drill illustrated. The V-belt runs over 2" and 3" pulleys on the motor shaft and drill spindle, using intermediate idler pulleys for right-angle direction change of the belt between motor and spindle. This bench drill is used for a variety of small work, which requires different drill speeds; consequently, some means had to be devised for changing the belt from one pulley to the other quickly, and still not affect the tension of the belt.



This was accomplished by mounting the motor on base A made from ½x6½ x6½" plate. Three lugs B were welded underneath and at the back of plate A and were drilled 1-1/16" from the top side of the plate. A similar plate C was made and bolted to the bench. Lugs D were welded at the back and on the top of plate C and drilled 1-1/16" from bottom side of this plate. The holes in the lugs on plates A and C were then reamed to take a ⅜" piece of cold rolled rod E, and this is the pivot about which plates A and C swivel



Two lugs F were welded at the front corners of plate C and were drilled and reamed to take a piece of ⅜" cold rolled rod on which eccentric G was keyed. A flat bearing plate H was welded to the underside of plate A so that eccentric G could bear against it. Finally, two springs J were applied by round-head screws to plates A and C as shown.

When necessary to change the belt, handle K is turned backwards. This revolves cam G against bearing plate H, thereby raising plate A about pin E as a pivot, and relieving the tension on the belt. As soon as the belt is changed from one pulley to the other, handle K is revolved counter-clockwise, and the springs J pull the motor base downwards until it rests on the cam G which becomes its lower position, and thereby re-applies the necessary belt tension to operate the drill-press handle.

New VERTICAL HEAD for VERNON #0 MILL

Fully Universal. Operates freely at *any* angle—in *any* plane. *Maximum distance, collet end of spindle to table top, 8½".* For the most complete Miller in the low priced field, *get the Vernon.*

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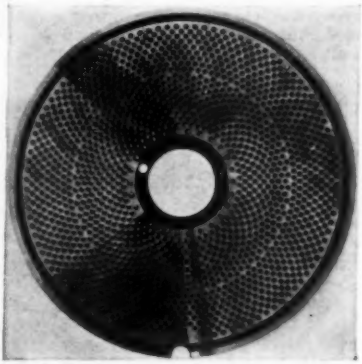
Vernon Line of HORIZONTAL MILLS, VERTICAL MILLS & JIG BORERS, 11" SHAPERS & GRINDERS

It is obvious that belt changing time is a minimum with this type of adjustable base.

Intricate Drilling Job

Along with everything else, hamburger production has taken a sharp upturn. Its use has been increasing from year to year and in these busy times, because it is pan-handy, quickly prepared and easy to "stoke", it is more widely used than ever before.

This has taxed the production capacity of Korrect Kutting Mfg. Co. of Glen Ellyn, Ill., a small but active company specializing in the manufacture of meat grinder plates and knives.



This firm experienced difficulty in drilling the holes in the disc which cuts the meat forced against it by the screw, which determines the texture of the finished product. The holes are close together and occasionally a metal section between holes broke out or cracked in drilling, resulting in a reject.

The holes are template drilled with a high speed drill. Because they are close together, multiple drilling is not feasible. The discs are subject to pressure from meat forced against them by the screw and while the fats help to lubricate the disc, the fibrin tends to

Drills

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Featuring:

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These are sturdy, dependable drills, capable of accurate drilling on rigid day-after-day production schedules. Supporting columns are rugged. The Lubri-sealed bearings assure easy running and long life. Working surface is handy—and the three spoke feed is fast and easy to operate. Capacity up to ¾" with ½ h. p. motor, or up to one inch with ¾ h. p. 1200 r. p. m. motor.

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METAL-WORKING MACHINERY and HAND TOOLS
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40% faster, 20% easier on the operator. Box and pan, as well as straight bending. Hardened jaws.

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Burke Machine Tool Co.
297 E. 16th St., Conneaut, Ohio

wear or round the hole edges which do the cutting.

Several steels in the low carbon range were tried from time to time with varying degrees of success, the Company finally standardizing on Speed Case (X1515), a free machining, fast carburizing open hearth steel plate.

It is explained that Speed Case has manganese and sulphur distributed throughout its matrix in minute globules, an analysis obtained by a patent process. Ordinarily both go into the slag as manganese sulphide, but through a special process, a portion remains uncombined. The presence of sulphur makes possible fast, dry machining and yet there is not enough sulphur present to cause the metal to be brittle. It is in fact a very ductile steel.

On the 8-¾" diameter disc shown, the manufacturer is claimed to have reduced drilling time 54.5% over the same disc made of SAE 1020. Additionally, facing time was reduced 41.25% and because of free machinability, drill breakage and wear were cut almost in half, drillcosts being reduced 93.75%. The wall between holes broke only in isolated cases, reducing rejects to a minimum.

After machining and drilling, the plate hardens with a minimum of distortion and cuts grinding time.

Speed Case, is a product of W. J. Holliday & Co., Hammond, Ind.

Grinding Motor Feet

The degree of care exercised in finishing off the feet of a motor frame so that they are exactly parallel to the line of the motor shaft greatly facilitates the ease and accuracy with which

DOUBLE YOUR DRILL PRESS CAPACITY
Minutes are Seconds with the new TWISTITE Vise.
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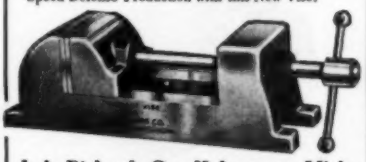

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8' stroke—12' stroke

Accurate—simple for tool-room manufacturing. Self-contained motor drive.

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Self contained and well built. Quick to change for length and diameter, for both shoulder work and gauging from the end. Chips fall away from gauging parts.

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RACINE SCREW WORKS
RACINE WISCONSIN

the finished motor can subsequently be lined up for coupling to the machine to be driven.

The actual "d" dimension, or distance from the center of the motor bore to the bottom of the feet, has to be held to fairly close tolerances, + 0 to -1/32" in the case of motors up 15 h.p., and + 0 to -$\frac{1}{16}$" in larger motors.

The finishing operation on the motor feet can be handled in any one of several ways. It can, for example, be set up on a shaper or a milling machine. Most satisfactory for this work, however, in the experience of the Reliance Electric & Engineering Co., Cleveland, is the use of a surface grinder.

The advantages of using the surface grinder appear to be at least twofold:- (1) very little stock need be removed to finish the bottoms of the motor feet, and (2) the feet need not be braced to avoid distortion because this danger is not present with such a light cut.

The surface grinder, installed to do this operation, is a rather unusual tool. Contrary to the usual design, in this machine the grinding head travels, while the worktable remains stationary. The reciprocating slide which carries the grinding head is driven through an oil pump mounted inside the base casting, and causes the abrasive wheel to make several passes across the face of the work during the grinding operation.

Close-up of a stator frame for a fan-cooled, enclosed Reliance a.c. motor, set up for grinding the feet. The feet are held within .005 inch of flat, on all sizes, and within 1/64 of an inch from the center line of the bore.

The grinding head is driven by a 50 h.p., 220-volt, 3-phase, 1750 r. p. m., splash - proof a. c. Reliance motor

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STEELGRIP Lacing — 8 sizes, applied with a hammer. For all flat belts on tough drives. Prevents end fraying.
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CONTINUOUS HINGES
All hinges shown can be furnished with special holes, cutouts and bends to blue-print in metals to suit the job.
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SPECIFICATIONS:
Open Width 1/8" to 6"
Gage Material .040 to .125
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Lengths to 120"
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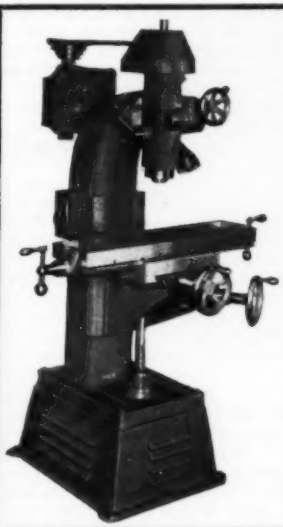

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Shown above: Sutton Feeder and Draw-in Collet

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for your screw machine

BRIGADE

Sutton Feeders (with long-life spring tension)

Sutton Collets (the only collets with Diamond Serrations)

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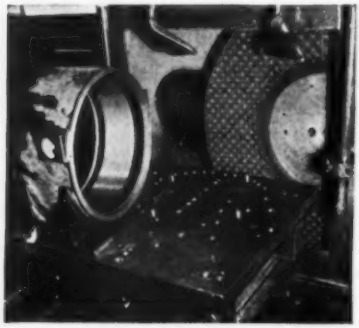
SUTTON TOOL COMPANY

2895 W. Grand Blvd., Detroit, Mich.
Accessories for Screw Machines

mounted on the reciprocating slide and connected to the spindle through multiple V-belts.



The type of fixture mounted on this table was specially designed by Reliance engineers. It accommodates nine sizes of motor frames, and consists simply of a piece of boiler plate surfaced on both sides, in which there are a number of holes having hardened and ground bushings.

A sturdy knee carries the slide upon which is mounted the worktable. The type of fixture mounted on this table was specially designed by Reliance engineers. It accommodates nine sizes of motor frames, and consists simply of a piece of boiler plate surfaced on both sides, in which there are a number of holes having hardened and ground bushings. All frames have finished bores and faces, these surfaces having been machined prior to the grinding operation.

Hardened and ground pins, lapped for a hand-wrung fit in the bushings and projecting above them, are provided. Since nine different sizes of frames are ground, each to be located by pins in four holes, there are 36 holes in all. The most important feature of these bushed holes is that they are so located that the bottoms of the feet of all sizes of frames are finish-ground to the same common line. Thus, when changing the setup from one size of frame to another, it is not necessary to change either the position of the cross-feed stop on the table of the machine, or to readjust the fixture itself. All the operator does is to pull the four pins out of the bushed holes, relocate them in the correct bushings for the bore of the next frame to be ground, and then secure the frame to the fixture plate by a central bolt and cross-bar.

In fact, the operation of the grinder is so simple that one operator not only handles it but also runs a drill press at the same time. The feet of one frame are drilled while another is being ground. The rate of production, while possibly not so high as would be the case if the operator handled the grinder only, ranges from 10 to 25 frames per hour, depending on the sizes of the frames and the amount of stock to be removed.

Landis Threading Brochure

An interesting brochure on their threading machines, collapsible taps, and die heads is announced by the Landis Machine Co., Waynesboro, Pa. Titled "Be Threadwise," it stresses the many ways in which such tools and machines are used in industry.

Accurate Hole Transfer Made Easy With NIELSEN TRANSFER SCREWS

Simply insert in holes, invert, strike sharply and you have centers and drill circles perfectly located. Reduce time and eliminate spoilage of other methods. 7 sizes U.S.S.—Inexpensive—last for years.

Write for Circular

NIELSEN TOOL & DIE COMPANY
1859 Gardner Ave.
Berkley, Mich.

McMAHON
Adjustable Angle Plate
For grinding any angle accurately.
Two sizes
Model "A" with T slots 3½x3½..... $12.
Model "D" with tap hole 6x7½ ..... $30.
Desirable territory open for dealers

FRANK McMAHON CO., 142 JUNE ST., DAYTON, O.

AUXILIARY STOCKROOMS

—Wherever You Need Them!

STACKBIN sections will give you a stockroom wherever you want it—quickly and easily as building a sectional bookcase. These patented sectional storage bins nest together without the use of tools—cost you nothing to build, nothing to move. Find out today how STACKBINS can lower YOUR handling costs.

Write to
STACKBIN CORPORATION,
55 Troy St., Providence, R. I.

STACKBINS
"STACKED AND STILL ACCESSIBLE"

NOW! The COLMONOY FURNACE WELDING PROCESS for Your Centerless Grinder Rests

This method consists of applying a casting of COLMONOY NO. 6 alloy to a steel base, by a furnace bonding process requiring no additional bonding material. One of the advantages of this process is its adaptability to high production parts, or intricate parts inaccessible for torch application.

COLMONOY NO. 6 is effecting substantial savings on machine tool parts subject to great wear and abrasion—lathe points, dogs, chip breakers, drill flutes, wire straightening shoes, thrust bearings, screw machine fingers, forming and drawing edges, etc.

COLMONOY may be cast or applied as an overlay, using gas or electric welding equipment.

WRITE FOR CATALOG

COLMONOY
Hard Surfacing Alloys and Overlay Metals

WALL-COLMONOY CORP.
Sixth Floor, Buhl Bldg., Detroit, Mich.

NEW YORK — 555 W. 54th St.
TULSA — 208 Midco Bldg.
BLASDELL, N. Y. — 21 Seneca St.
WHITTIER, CALIF. — 122 W. Philadelphia St.
CHICAGO — 625 W. Jackson Blvd.

NEW HOME for "GREENFIELD" Gages

Memorial Day at *"Greenfield"* was marked by the opening of this new modern air-conditioned plant, devoted entirely to the manufacture of Plain, Thread and Limit Snap Gages. It will more than double *"Greenfield's"* gage manufacturing capacity and symbolizes *"Greenfields"* determination to cooperate in every way with the national defense program.

The most modern machinery and complete air conditioning will materially assist our hundreds of trained and experienced gage workers to maintain the closest possible control over manufacturing conditions. Even with the greatly enlarged output that the new building makes possible, individual quality and accuracy will be maintained and increased.

Increased research and testing facilities are an important part of the new equipment and will be used unceasingly for the benefit of our friends and customers.

GREENFIELD TAP & DIE CORPORATION, Greenfield, Massachusetts

Detroit Plant: 2102 WEST FORT ST.

Warehouses in New York, Chicago and Los Angeles. In Canada: Greenfield Tap & Die Corp. of Canada, Ltd., Galt, Ont.

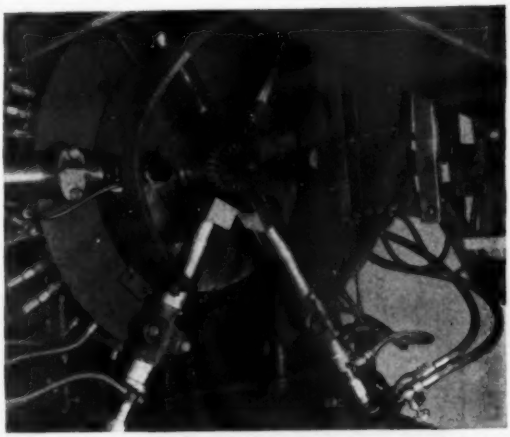
GTD GREENFIELD

Taps - Dies - Gages - Twist Drills - Reamers - Screw Plates - Pipe Tools

What's New in the Industry

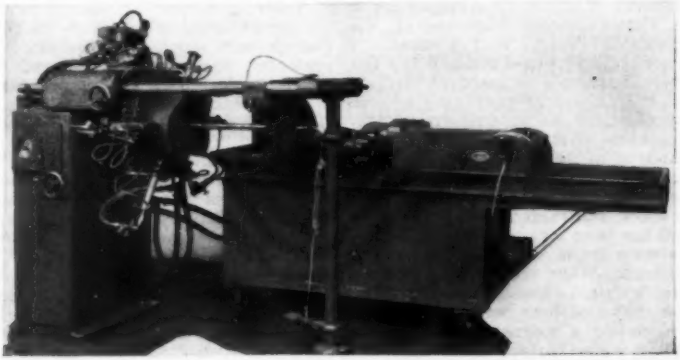
Fellows Flame Hardener

THE Fellows Flame Hardener is an automatic, time - controlled machine for heating parts to be locally hardened. Based on "spinning" or work-rotating, it is claimed to possess such advantages as uniform distribution of heating, controlled depth of heating, controlled time, and minimum distortion. Gas economy is also claimed.



By this method it is possible in many cases to heat those portions of the blank to be hardened without affecting the remainder of the blank. Gear teeth, for example, may be thoroughly hardened while the center of the gear remains unhardened and tough. Local "masking" and water cooling may also be employed when desired.

The work is held on an arbor, as shown in above illustration, or between centers, as indicated in general view of machine. It is rotated at the desired speed by a motor through a



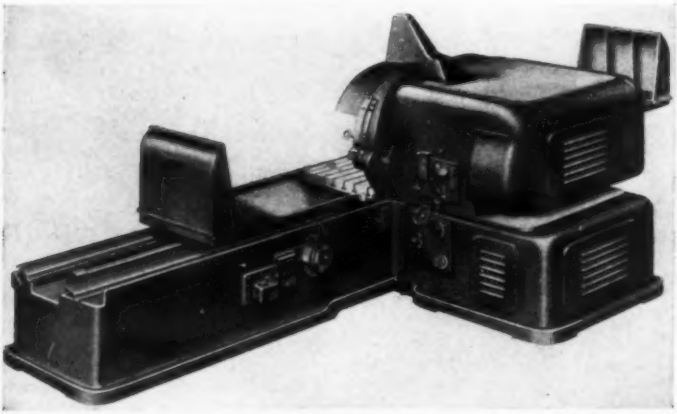
variable speed drive. Six torches are provided, each with 15 flame tips. An automatic timer turns off the gas and stops the machine when the desired temperature has been reached. Work held on an arbor is then ejected automatically and transferred to the cooling tank by the transferring device shown.

The quenching tank is provided with a two-speed motor-driven conveyor to vary the time of quenching. This tank has integral tray or draining shelf and is mounted on wheels so that it can conveniently be placed in the desired position relative to the machine. A water-cooling system with pump agitates the liquid to maintain proper temperature.

Operator convenience and safety are afforded by water-cooling the torches and all other parts of the machine subject to human contact. A water-cooled shroud surrounds nearly the entire work head of the machine.

Torches, valves, and the rest of the flame equipment are provided by the Linde Air Products Co.

Diamond Face Grinder



Diamond Machine Co., announces a new Face Grinder, known as the "Philadelphia Type," in two sizes.

The chief advantage claimed for this machine is increased speed of production. It is said that machining time in many cases can be reduced very materially over that required for other methods of surfacing.

Control levers, wheel, push button instrument dial and oil filling points have been centralized.

Bed has been lengthened so that even at extreme limits of travel, platen never overhangs. Ways are wider apart, assuring a rigid foundation for table. Platen has also been widened to allow for mounting a magnetic chuck or for grinding wider parts.

Table is driven by pistons mounted in double opposed cylinders, the rods of which are always in tension. This patented arrangement, powered by a Hele-Shaw pump, is known as the "Fluid Tension" drive and affords uniform table speed in both directions of travel.

Main spindle is driven by vee belts. Wheel head can be rotated horizontally as much as 15 degrees for concave grinding. There are two sizes of grinders - 30" and 36"- corresponding to diameter of grinding wheel. In both sizes, sectional abrasive blocks are chucked firmly against a solid rim.

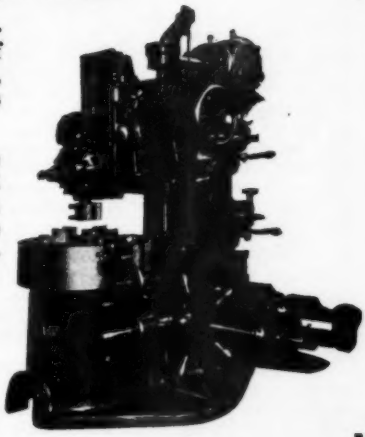
Coolant is directed against grinding wheel by an improved nozzle.

Wheel is dressed by a remotely con-

We Rebuild Your Tools

For Accurate Work on Today's Tasks

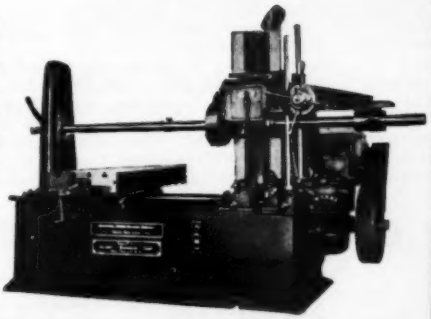
MACHINES like these were rebuilt for various arsenals of Great Britain, Canada, India, Union of South Africa as well as for leading domestic plants.



"The job of putting all available machines to work" means YOUR machines too — machines now in your shop — that are not up to the right degree of accuracy in production.

You may not want to send us a whole battery of boring mills or milling machines for instance, for rebuilding. BUT you can send one or two at a time.

Visit our plant—see the machine tools being tested under power—convince yourself that the job of rebuilding these machines is done with care and precision and with a minimum of delay.



●

Write for prices—tell us what tools need rebuilding—give complete details.

●

ATLANTIC MACHINERY CORPORATION

149 BROADWAY **NEW YORK**

Tel. WOrth 2-0662 **Cable Address: Atmacor**

trolled hydraulic wheel truing device, adjustable for all positions of wheel head.

Protection is provided against flying abrasive particles, splashing of coolant, and grit entering ways or motor windings.

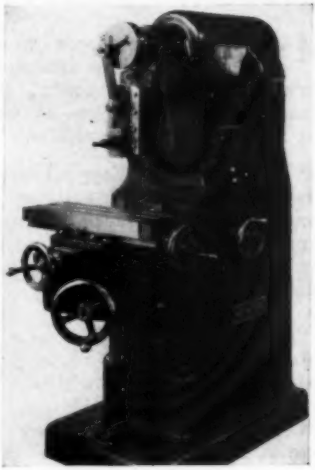
Beds of both models are the same, occupying a space 229x48-½". Floor space for either machine is 111" front to back, 330" end to end, allowing for table clearance. Speed of the 30" wheel is 530 r.p.m., 440 r.p.m. for the 36" wheel. The 30" machine accepts work 17-½" high with front guard in place, or 23-½" high with guard removed. The 36" machine accepts work 23-½" high with front guard in place, 29-½" high with front guard removed. Length of work accepted by either machine is 84".

Hunter Vertical Slotter

A new variable speed vertical slotter designed for die shop, tool room and general repair shop operation has been introduced by the Hunter Engineering Co., Riverside, Calif.

The Hunter Vertical Slotter incorporates a number of features that make it adaptable to a wide variety of machining operations. The work table is provided with longitudinal T-slots and is adjustable by hand feed in longitudinal and transverse directions and vertically. Maximum stroke of the ram is 4-½". The ram may be tilted either right or left through a 10° angle for the cutting of tapered key-ways, etc. The number of strokes per minute can be varied from 90 to 180. The positive acting clutch may be operated from either side of the machine and makes it possible to stop the ram at any point. The machine is extremely compact, being only 63⅜" x 38" x 48".

Complete specifications of the Hunter Vertical Slotter are available from the manufacturer.



Electric Hoist Catalog

Catalog H-40 describes the construction, operation and application of Lo-Hed monorail electric hoists. Contains 26 pages and is well illustrated. Complete with capacities, speeds, heights of lift and specifications. Address American Engineering Co., Philadelphia, Pa.

HARD USAGE Doesn't Faze The HARTFORD MILLING VISE

Because it was designed to "take it"—and it does! It will stand up, day after day, under the heaviest, toughest strain of production milling work. Made of the best materials, with all parts interchangeable, it will outlast four or five ordinary vises. Rapid and accurate in operation—the top eccentric handle gives tremendous binding force, while the lower cam-faced handle gives instantaneous quick-opening and return. A trial in your shop will convince you better than anything we might say.

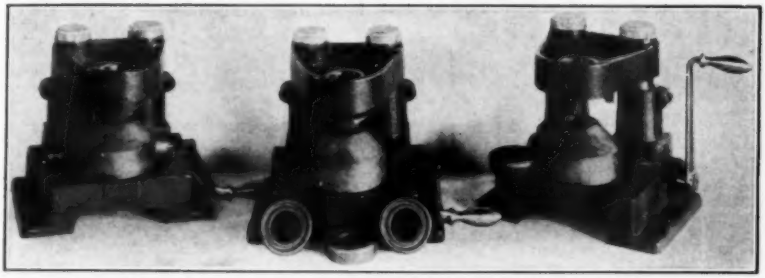
Write for Folder and Complete Details

Jaw width ..... 5' Maximum opening 3½'
Jaw depth ..... 1¼' Weight ..... 40 lbs.

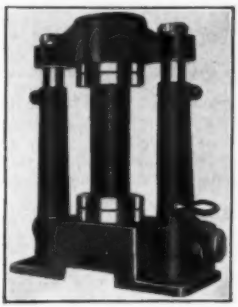
Also made in the swivel-jaw type with hard or soft jaws, maximum opening 2¼'.

We also Build Machinery on a Contract Basis, Design and Develop Special Automatic Machinery—Gears and Cams Cut to Order.

HARTFORD SPECIAL MCHY. CO.
285 HOMESTEAD AVE., HARTFORD, CONN.

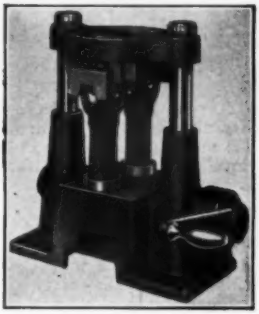


Let Us Solve Your Drill Jig Problems...



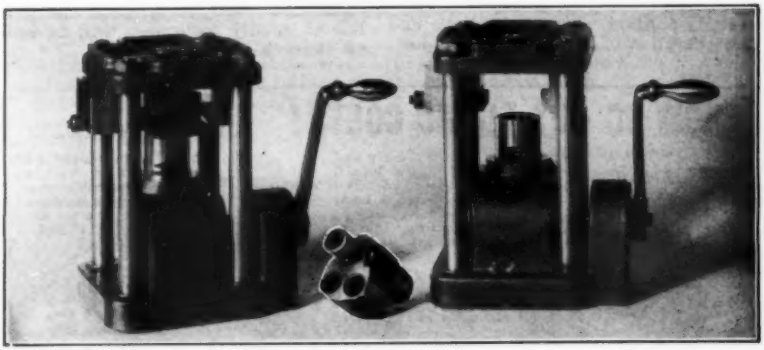
Whether it's Diesel Injectors or Cylinder Heads, we have the experience... the modern facilities to equip you with Siewek Rapid Drill Jigs that will pay dividends in time and labor savings on high speed production.

Send for catalog showing our complete line.

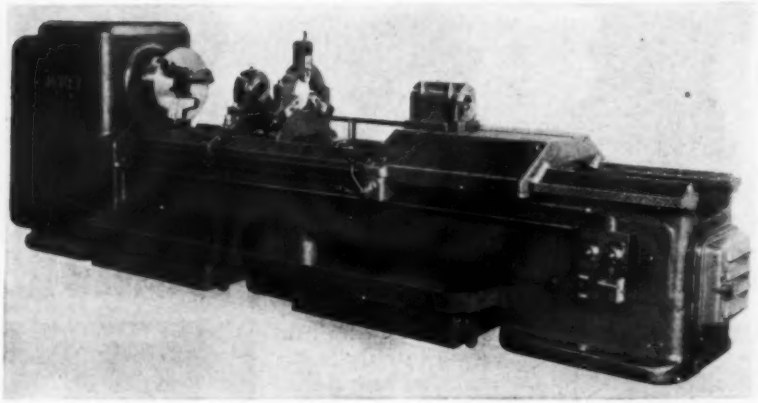


THE SIEWEK TOOL COMPANY

FERNDALE, MICHIGAN



Morey Drilling and Reaming Machine



A new 27" Deep Hole Drilling and Reaming Machine, equipped for boring 155 m. m. gun recoil cylinders has been developed by Morey Machinery Co. It is suitable for drilling, boring and reaming cylinders, gun barrels, etc., and is built in any length to suit specific needs.

Spindle speeds to suit the work are obtained by pick-off gears.

Feed and power traverse in both directions are hydraulic and infinitely variable from 3/8" per minute to 75' per minute.

An essential feature of the design is the provision of two levers in the operator's position which control the entire operation of machine.

A coolant system is provided with safety devices to stop the machine instantly for all contingencies, such as failing of the lubricant supply, dull drills, hard spots in the material, etc.

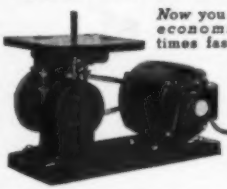
GS Machinists' Tool Chests

George Scherr Co., 122 Lafayette St., New York announces its own line of GS Machinist's Tool Chests. Produced in a specialized woodworking shop under the supervision of a cabinet maker with many years experience, the GS line includes solid oak, leatherette and a low-priced line of poplar chests.

Literature fully describing this new line of quality tool-chests will be sent on request.

HOW TO CUT FILING COSTS!

WRITE FOR A BULLETIN TODAY!



Now you can file *accurately* and *economically*. File at least 6 times faster than by hand. You can save labor costs too, because anyone can do precision filing with this machine.

These machines are built to do the heaviest filing work. Each is made of reinforced cast iron—8' x 8' ribbed table, scotch yoke action, block is hardened and all pins are tempered. Get complete information!

(Agents wanted)

Postel Filing Mch. Co.
915 Washington Ave. So.
Minneapolis, Minn.

AMMCO 6" SHAPER

"A precision machine of a thousand uses"

- - IT'S PORTABLE - -

Saves Steps and Time

Don't tie up a big shaper when so many jobs can be done just as accurately and much quicker on AMMCO 6" PRECISION SHAPER . . . Available for stationary installation or mounted on portable cabinet easily rolled to the mechanic's workbench.

Features of this Shaper include quick adjustment of stroke, ram position, tool head, table height, table support, feed and speed . . . The maximum length of stroke is 7¼" . . . Table has five cross feeds (reversible) . . . Countershaft has three-step cone pulley . . . ¼ or ⅓ H.P. Motor.

Manufactured by an organization having years of experience in producing precision machinery . . . Recommended by leading machine tool dealers and machine tool manufacturers.

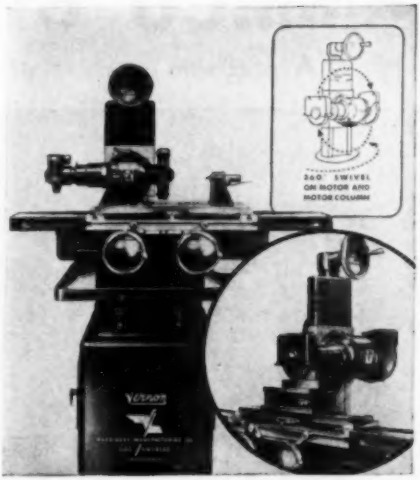
Write for Specifications and Prices.

AUTOMOTIVE MAINTENANCE MACHINERY CO.

2106 Commonwealth Avenue, North Chicago, Ill.

Tool, Cutter and Surface Grinder

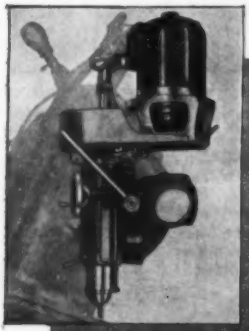
A new combination Universal Grinder for all types of tool, cutter and reamer grinding, internal and external as well as surface grinding, is offered by Machinery Mfg. Co., builders of the "Vernon" Line.



This machine embodies several new features. The motor which carries the grinding wheels swivels through 350° vertically, and the column on which the motor is mounted also swivels through 350° horizontally. Many important advantages are afforded by this arrangement. For example the center of the motor and column are positioned to align either cylindrical or surface grinding wheels with the center of the bed, providing full grinding range without elongation of the ways.

When used as a surface grinder, the machine accommodates a 6"x 10" magnetic chuck and will grind a complete area of 6"x16"x7½" above the table.

Rigidity has been maintained in the surface grinder by making it an in-

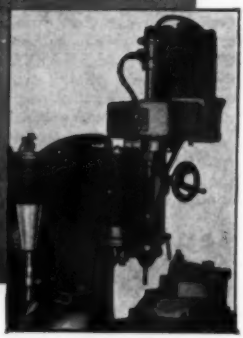


EKLIND UNIVERSAL MILLING HEAD
AND TURCHAN
HYDRAULIC DUPLICATING UNIT

Model A HC Eklind Turchan Duplicating Attachment is designed and priced for die shops making Bakelite, Plastics, Rubber and Drop Forge molds and dies. Will handle average work efficiently, economically and speedily. Oil pressure controlled by tracer, feeds spindle and tracing arm to follow model accurately. Die capacity is 16" long by width depending on cross feed of machine. Capacity can be increased by mounting head on side of overarm.

Model A H Eklind Universal high speed Milling, Drilling and Boring unit is a most valuable tool room aid. Can be had separately and the duplicating attachment added later.

Send for our bulletins giving full details and prices.



UNIVERSAL HIGH SPEED TOOL CO.
551 W. Washington Blvd., Chicago, Ill.

IMMEDIATE DELIVERY

FOR USE ON

DEFENSE PRODUCTION

Mijit and Esco Jigs are standardized items kept in stock for quick shipment. More than 50 styles and sizes are available. Generally, one can be chosen which, with a simple adapter block will fit your purpose. They save long hours of jig and fixture design—many costly hours of toolroom work—and speed up machining operations enormously. At the upper left is shown the Esco Jig, one of the many styles available. Upper right is featured the Mijit Jig, and lower center shows the Jack Lock, a unit providing a simple adaptable locking device for large fixtures and applicable to milling machines and planer operations. All these, plus our many others, are available for immediate delivery. Why wait longer? Order yours today, or write for free information and details.

ESCO ENGINEERING CORPORATION

4855 FOURTH AVE., DETROIT, MICH.

The CRITERION
Carbide Tool
Grinder

GREATER PRODUCTION CAPACITY

Provides positive rapid adjustment to meet the rigid requirements of production tool manufacturing. Built for continuous service. Adjustable coolant system. Large work tables instantly adjustable without wrenches or other tools. One-third H.P. balanced precision bearing motor completely enclosed and radially mounted in rubber. Standard equipment: One 60 and one 100 grit 7" dia. steel backed silicon carbide wheels. Ideal for metal bonded or Resinoid bonded diamond wheels.

Order from your dealer or write direct. Request literature. No obligation.

CRITERION
MACHINE WORKS
BEVERLY HILLS, CALIFORNIA

tegral part of the machine instead of the customary extension shaft.

The machine table is traversed by a two speed hand wheel and may be operated from either front or rear of machine.

By tilting motor and swiveling column, carbide tools can be ground.

Provision is also made for use of a coolant pump.

All standard attachments are furnished. Attachments for internal grinding and a motor driven head for rotating work may be included as extras.

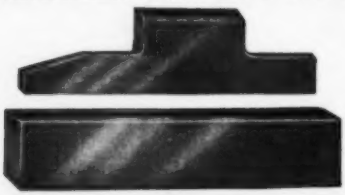
Swing is 8". Will accommodate 16" between centers, hand longitudinal feed, 16"; vertical travel of motor, 8"; in-out travel of column, 6"; weight approximately 800 lbs. net.

Alphil Spot Welders

A bulletin is announced by the Alphil Spot Welding Co., 431 W. Broadway, New York, N. Y. It describes their line of spot welders.

The Alphil line features water cooled electrodes and tips, adjustable arms, swivel foot pedal, and heat regulator. An automatic trip switch is available for welding stainless steel and nonferrous metals.

LENGTHEN LIFE OF...
CENTERLESS GRINDER BLADES



- 10-30 Times Longer Life
- Reduce Replacement Costs
- Do Not Mark or Score Work
- Improve Accuracy and Efficiency

WHEN Tool-Tipped WITH
TUNGSTEN CARBIDE WEAR STRIPS
Made in Any Length, Shape or Size

METAL CARBIDES CORPORATION
YOUNGSTOWN, OHIO

Work Wanted

A NATIONALLY KNOWN MANUFACTURER OF PRECISION MACHINERY HAS FACILITIES FOR TAKING ON ADDITIONAL WORK for: W. & S. Turret Lathes, Boring Mills, Lathes, Punch Presses, Screw Machines, Precision Cylindrical and Internal Grinding, also Sub or Full Assembly Work.

BOX 142
c/o Hitchcock Publishing Co.
508 S. Dearborn St., Chicago, Ill.

The ACME JIG BUSHING CATALOG Can be seen from two sides

One is *GREEN* for the A. S. A. Standard.
One is *RED* for the Acme Standard.

Together these standards furnish the most complete selection of standardized jig bushings available.

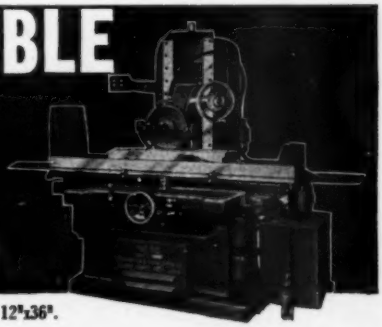
Write for this catalog. It will help with the selection of bushings for your jigs and fixtures.

ACME INDUSTRIAL COMPANY

Makers of Standard Jig and Fixture Bushings

210 N. Laflin St., Chicago, Ill., MONroe 4122

INDISPENSABLE *for* DEFENSE PRODUCTION



No. 55 Table speeds up to 125' per min. Working Surface 12"x36".

This Grand Rapids Grinder, and others, will enable you to meet the demands of the present Defense program. They offer you new standards of grinding performance— new production economies and new facilities for improving your products.

Let us send you complete details on these and other GRAND RAPIDS GRINDERS.

GALLMEYER & LIVINGSTON CO.

405 STRAIGHT AVE., S. W. GRAND RAPIDS, MICH.

THIS STRIKING CENTER PIECE WAS AN ARRESTING FEATURE OF THE COOPERATIVE EXHIBIT OF MACHINE TOOL MANUFACTURERS AT THE RECENT MIAMI VALLEY DEFENSE EXHIBITION AT CINCINNATI. THE FIVE BASIC MACHINE TOOL OPERATIONS — MILLING, DRILLING, TURNING, GRINDING AND PLANING WERE STRESSED WITH SPECIFIC EXAMPLES OF PEACE TIME AND DEFENSE PRODUCTS MADE BY THESE FUNDAMENTAL MACHINING PROCESSES.
(Photo-Courtesy Cincinnati Milling & Cincinnati Grinders, Inc.)

A GOOD PRESCRIPTION for Many Production Headaches

Rx

THE national defense program has made many new friends for Cerromatrix, the low-temperature-melting alloy that expands slightly on solidifying. For locating punch and die parts, anchoring stationary machine parts, making chuck jaws, and for many other tasks, Cerromatrix makes it possible to catch up with the extraordinary demand that now faces the metal-working industries.

Send for our free Cerromatrix Manual describing many ways to use this valuable material.

CERRO DE PASCO COPPER CORPORATION
40 WALL STREET NEW YORK, N. Y.
BRITISH ASSOCIATES: MINING & CHEMICAL PRODUCTS LTD., LONDON
CANADIAN DISTRIBUTORS: DOMINION MERCHANTS LTD., MONTREAL

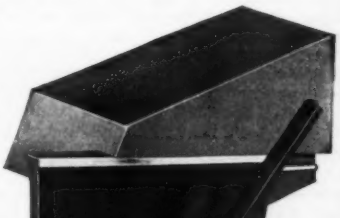
NO MORE CUTTING-OFF WORRIES

Luers Patented Cutting-off Tools Eliminate 90% of All Cutting-off Troubles

Luers cutting-off tools are lowering costs and keeping production high because the patented Luers blade has a combination of three important advantages found in no other cutting-off blade. These three features are ***built into the blade itself,*** and retain their efficiency throughout the entire length of the blade:

1. The Luers blade is T-shaped, which provides built-in ***side-clearance*** and prevents excessive side friction.
2. The Luers blade is tapered throughout its entire length, which provides built-in ***back clearance.***
3. The Luers blade is hollow ground on top, cutting a curved chip that is free to expand without binding.

But that's not all. These cutting-off tools give a finer airplane finish. They require grinding on the front face only. They cut the non-productive time needed to remove, grind, insert and realign. They have been enthusiastically adapted by many of America's largest industrial producers. Special holders are available for all automatic and hand screw machines.



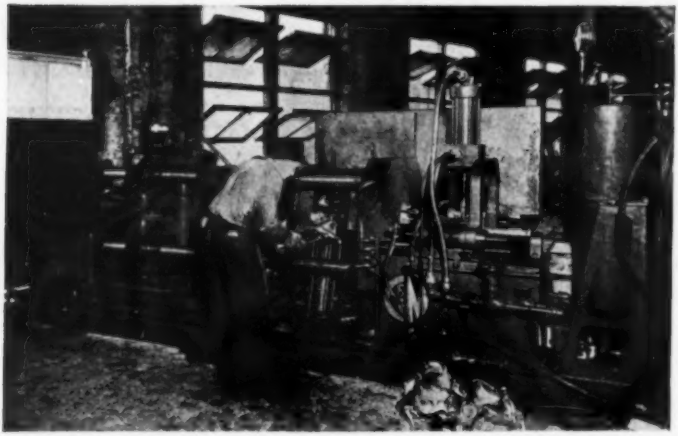
Produced under license issued by John Milton Luers Patents, Inc.

WRITE FOR CATALOG

State make and model of your equipment.

EMPIRE TOOL CO. 8790 GRINNELL AVE. DETROIT, MICHIGAN

All-Welded Diecasting Machine Speeds Defense Work



All-welded diecasting machines, sufficiently strong and rigid to make sound castings with little "flash" on high speed production schedules are now in successful production at the G. & N. Mfg. Co., Cleveland, Ohio. These machines, designed for casting of zinc, tin, lead, aluminum, brass and magnesium alloys, employ massive steel welded construction in the base, cylinder mounting, cylinder head, furnace, hydraulic fluid tank, shot cylinder, and goose-neck support. Only a few bolts and stud fastenings are used throughout the machine. Die plates of 6" thickness and 4" tie bars running through them preclude possibility of breakage and assure rigidity.

The machine pictured employs three hydraulic core pullers which work cores in three different directions. These automatic core pullers permit extremely rapid operation. It is asserted that when making small simple castings without cores or complex parts and using automatic ejection, the machine may be operated at a speed of 600 cycles per hour. Due to the sturdy construction, this machine has been found to operate satisfactorily at rates 20 to 30 percent higher than those usually practiced.

(Photo Courtesy Hobart Bros. Co., Troy, O.)

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2" to 72" Dia.

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30 Day Free Trial Offer.

Stock most Standard Sizes to 16" Dia.

Shut Off Expense Caused by Slippage You Save Money on Every Installation

NEW LOW PRICED PRODUCTION LINE

SOME OF SIZES LISTED BELOW **Send for List—On the Shelf**

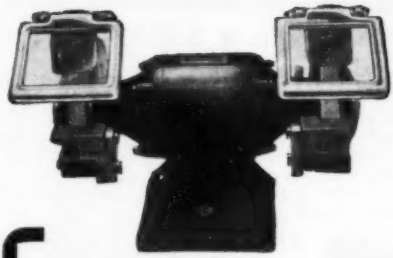
Dia.	Face	Price	Dia.	Face	Price
2 "	x2½"	$1.25	4 "	x3½"	$2.85
2½"	x2½"	1.45	4½"	x5 "	3.95
3 "	x3 "	2.25	5 "	x4½"	4.25
3½"	x3½"	2.55	6 "	x5 "	4.75

Increase *your* Production

We supply Fractional Dia. and Face Pulleys—From large casting stock.

VACUUM CUP METAL PULLEY CO., INC.

12535 Grand River Ave., Detroit, Mich.



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Leading Independent Motor Manufacturers

DAYTON, OHIO

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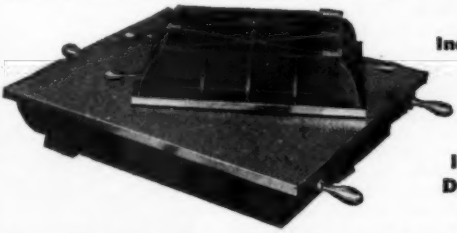
Annealed—Finish-Planed and Scraped to Assure Accuracy



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These Surface Plates provide accurate surfaces and are indispensable in modern production, Tool and Jig building WHERE ABSOLUTE ACCURACY IS REQUIRED.

Made of close-grained semi-steel, specially treated to overcome strains and distortion after machining and scraping. Heavy deep ribs support the underside, assuring rigidity and accuracy. Furnished with sturdy three point bearings insuring maintenance of same accurate support when scraped. Wood cover and handles furnished with each surface for protection. *Write for Bulletin No. 107 giving full details.*

J. C. BUSCH COMPANY ENGINEERS AND MACHINISTS SINCE 1907

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SAVE ON LIFTING
with the Nilson Tilting Wire Reel

Lost motion, false motion and unnecessary motion all cost money. Only a little at a time perhaps, but over the period of a year, the total would be impressive. Why not save this? Useless motion also represents a loss. Lifting heavy coils of wire wastes time and energy. Why not let NILSON save this too?

A foot lever is tripped, the guards removed, a coil of wire slid upon the carrier, the guards replaced and set screws tightened, an easy lift, and the counter-balancing weight does the rest, bringing the tilting section to a vertical position, ready to feed the wire into the machine.

Send today for Bulletin No. 51 and learn how you save in other ways too.

The A. H. NILSON Machine Co.
BRIDGEPORT, CONN., U.S.A.

Portable Gear Checking Recorder

A new development in gear checking equipment by which chart records of involute form and lead can be obtained from gear checkers of the indicating type, is announced by Michigan Tool Co.

The new recorder, operating on a new electrical principle for gear recording devices, can be coupled to any Michigan Sine-Line lead checker or involute checker for gears or hobs by simple changes to provide for the required electrical connections. It operates on standard 110 volt a. c. and is adaptable to use with other makes of checking equipment.

Operation of the new recorder is based on the use of synchronous devices, one located in the recorder and one installed on a bracket in base of gear checker. Any motion imparted to one of them is automatically and accurately duplicated in the other through electrical connections between the two units. Thus, the use of such devices provides the same effect as coupling the

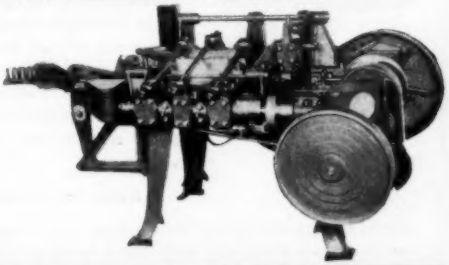
CHECK THESE FEATURES

of the Nilson Automatic Metal and Wire Forming Machine

- Open construction of press and forming tools.
- Patented slide feed with an independent cam-operated wire gripping device.
- Power operating wire feed is transmitted through a straight line.

The NILSON AUTOMATIC Metal and Wire Forming Machine meets Today's industrial requirements. Engineered with a 50-year back-ground of experience in designing and building metal forming machines, this S-3-F machine is setting new records in speed and uniformity of products.

Write TODAY for information on all types of metal forming machines



The A. H. NILSON Machine Co.
BRIDGEPORT, CONN., U.S.A.

two units together through solid shafting.

The synchronous device in the gear checker is connected directly to the sinebar table. The device in the recorder is connected to the chart drive.

A second electrical connection between checker and recorder actuates cross movement of recording pen in relation to movement of an indicator mounted on gear checker. This indicator replaces the conventional indicator by merely removing two screws and attaching the new unit. Movement of the electrical indicator pen on the chart is magnified several times between indicator and recorder. Vertical graduations on the recorder chart are thus in ten-thousandths of an inch, while horizontally, one inch is equivalent to 4 degrees of rotation of the work carrying spindle.

Three switches are provided on recorder. One of these is a master switch. The second switch disconnects the synchronous device in the recorder, permitting setting-up of checker without moving the chart paper. The third switch reverses action of the synchronous motor in recorder. When this switch is on, the chart paper moves in a proper direction to check the opposite side of the gear tooth.

When master switch on recorder is in the 'on' position, a red light shows on the switch panel. A green light appears when the chart switch is 'on'. A knob is provided for adjusting recording pen to desired location to 'start' on the chart.

A button release is provided on chart roll to permit moving chart by hand, for setting to desired "starting point". A hinged Lucite cover is provided over the chart roll and recording needle. This cover is also provided with a knife edge to permit tearing off the chart by pressing down lightly on cover (against light spring pressure).

Installation in the field merely involves placing a sprocket on the sinebar table shaft, mounting motor brackets in base of machine and replacing the indicator.

NICHOLSON CONTROL VALVES

are made in two, three and four-way types for air, oil, water, steam, gas, etc., pressures to 5000 lbs. Style E is a general purpose valve for pressures to 300 lbs. Various metal combinations to suit any medium. Style J is for air and oil only, pressures to 125 lbs. Style H is a balanced hydraulic valve for pressures to 5000 lbs. We also manufacture foot, solenoid and motor-operated valves.

Style J

Style E

Style H

Bulletins on request.

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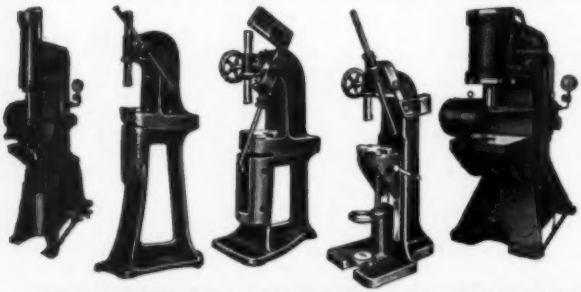
For AIRCRAFT and MUNITIONS



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NASHUA Est. 1883 NEW HAMPSHIRE

"Sevens" Deals a Winner

By SAM MELLOR

"FOR the lov'a leapin' goldfish!" exploded the General Manager of the Emerald Parts Corp., as he burst into the office of Sevens, the production superintendent. "The purchasing department says we can't get those millers ordered 'way back in the Stone Age for another 90 days. How we gonna get out from under that Navy contract? I wish somebody'd answer me that—90 days—bah! Three whole months, an eternity, to go crazy in tryin' to push even harder every bit of our equipment that's already overloaded. This is a fine swingin' door to be caught in — just when I thought everything was set to go along full blast. What are we gonna do?"

The victim of this outburst was Severn Wilde, nicknamed "Sevens" because he was an inveterate and canny poker player wherever and whenever the opportunity afforded. And he liked that nickname.

After waiting for the G. M. to clear this eruption, Sevens pulled his eyes into one of his accustomed analyzing-without-betraying squints and, aiming it at the G. M., calmly observed—"Well, George, you opened this pot when you gave delivery dates on that contract before we had enough tools in our hands

A typical belt grinding job, facing stainless steel discs used in airplane cameras. The belt is backed by an accurate hard steel backing plate and is kept wet by a continuous built-in water spray.

to handle it, so I guess it's your bet.—But you gotta draw comin' yet, you know."

"Great gobs'o grief, man, what have I got t' draw to?" gasped the G. M. But then a queer grin appeared on his face as he drew up a chair, sat down, reached into Sevens' humidor, drew out a cigar, lighted it and relaxed a bit. It just dawned on him that whenever Sevens started talking in poker terms there was usually some solution to any problem under discussion.

"What have you got to draw to? You still have your openers," said Sevens, with a tantalizing tinge in his voice, "and a fellow usually draws to them, doesn't he? Unless, of course, he stands pat, and it's plain to be seen your hand is very unpat."

"Whatdoyuh mean, I got openers?" eagerly asked the G. M., by now quite sure Sevens saw a way out.

"Well, George, you've got your present equipment and help, to begin with, so now all you need is the right draw to take the pot."

"Yes, yes, I know, and I counted on those extra millers to fill the hand, but now they're not even in the deck," complained the G. M.

"Well, you don't need 'em!" startlingly announced Sevens.

"What!" popped the G. M. "We don't need 'em? Well, if we don't need 'em right now as much as a suffocatin' cat needs air, what do we need? Come on, man, if you've cards up your sleeve, out with them before I go completely nuts," exhausted the G. M.

But Sevens was not to be rushed. His most enjoyable moments were those in which he could hold someone in suspense. After he had lazily leaned back in his chair, stretched, and half dreamily contemplated, with a reminiscent yet unrevealing expression, a cloud of smoke from the G. M.'s cigar hovering over his head, he quietly remarked, "Yes, George, I do have at least one card up my sleeve, and it's a "beaut." You know when I was over at that Tool Engineers' show I saw something mighty interesting."

"You did?" eagerly inquired the G. M. "Tell me about it."

"Yes, George,—I saw a chap demonstrating a machine that takes a lot of work off a miller."

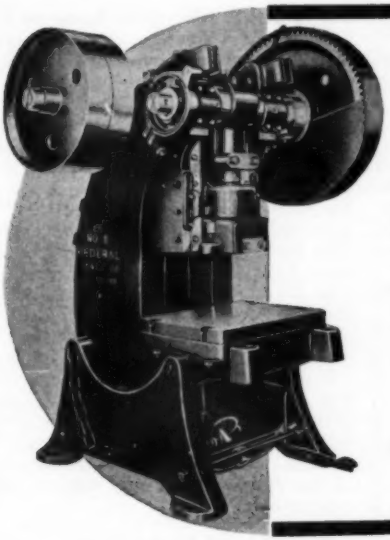
"Oh," groaned the G. M., "I thought you had something better than that. Why if it's machinery, it'll likely take more time to get than the millers."

"Now, if you'll just let me finish this," suggested Sevens, "I'll show you how this draw will win the pot. I'll guarantee it."

Removing extrusions from the edges of die cast parts.

"Go ahead, I'm listening with both ears. What is it and what'll it do?" dejectedly countered the G. M. feeling that perhaps he had put too much confidence into his previous belief in Sevens' poker talk infallibility.

"Here's something the fellow gave me," said Sevens as he pulled a little



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Write for details about this production-increasing machine.

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What's NEW in BUFFERS

Paramount considerations in selecting a buffer are correct wheel speeds and ample motor power. The Selective Speed Marschke Buffer shown here provides 3 HP to 5 HP in three speeds, to take care of a wide range of metal finishing requirements. Ball bearings, spindle, and every other detail of design have been combined with highest quality of materials and workmanship to give you years of dependable production with little maintenance expense.

Write today for Bulletin showing Marschke Pedestal and Swing Frame Buffers, to Vonnegut Moulder Corp., 1805 Madison Ave., Indianapolis, Indiana.

The Quality Marschke Line: Heavy duty Grinders and Buffers; bench, pedestal and swing frame types; 1 to 25 HP.

★ THE MARSCHKE LINE ★

booklet from his pocket, "If you'll just check through it you'll find the winning cards. I did! In fact, I've a whole plan worked out around belt grinding that'll not only save our hides on deliveries, but save us money in the bargain."

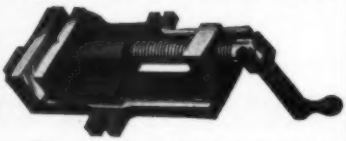
"The heck you have!" excitedly cried the G. M. as he started to scan the booklet.

"You bet I have, and once you see, as I did, how those operations are done with a belt grinder you'll know we hit the jackpot. You see, it's this way: Our millers are overcrowded with plenty of rush work ahead, and no more millers are to be had in a hurry, so let's just see how much of their work can be done on a belt grinder to relieve them. Here are some jobs," Sevens continued as he took the booklet out of the G. M.'s hand and opened it. "It says right here that belt grinding, and with unskilled help mind you, will produce a surface within two thousandths free hand, and I saw it done. Why, George, it's just the thing for those side-arm castings that haven't a chance of getting to our millers in weeks. And it'll do those round ends on part 1182 without special radii cutters . . . and here's a couple dozen other parts we're making that'll go like hotcakes on a belt grinder. Fact is, we can even do a lot of the finishing this way after rough milling only."

"But—" broke in the G. M.

"Now don't 'but' me yet, George," Sevens went on, "you got me started. Now let me finish. There's plenty more to tell you about this, that I saw done my own eyes. You know those jacket sleeves are gonna give us a bundle of trouble from distortion unless we put true locating surfaces on them they're clamped in the fixture, and a belt grinder is the berries for that job. If you'll just take a gander down this

YOST DRILL PRESS VISE



This new Yost vise has been designed expressly for use on drill press operations. Does away with special and costly jig fixtures.

Offered in two sizes.

Vise No.	Width of Jaw, Inches	Opens Inches	Weight Pounds
1D	3½	3½	12½
2D	5	5½	23

Do you need a vise of ANY type?

Write today for bulletins on the extensive Yost line

YOST MFG. COMPANY
1335 SO. MAIN ST.
MEADVILLE, PENNSYLVANIA

ARMOR MILLING MACHINE
HYDRAULIC POWER FEED

Smoother action—faster production—countless table feeds—up to 6' a minute. The milling machine with the latest improvements to meet today's unprecedented demands.

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CUTS GRINDING COSTS

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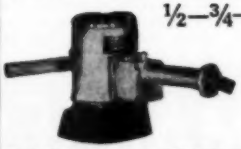

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The knurled points lock automatically into place, and HOLD TIGHT regardless of vibration — a wonderfully inexpensive and efficient insurance against breakdowns, stoppages and repairs. Can be used over and over again.

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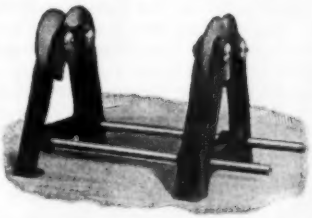
Every shop handling rotating parts needs this simple, sturdy, dependable device for balancing, straightening and truing operations. Saves time and trouble and assures better work.



Swing	Greatest Distance Between Standards	Capacity in lbs.
20 in.	20 in.	1,000
40 in.	30 in.	2,000
60 in.	30 in.	2,000
72 in.	66 in.	5,000
96 in.	88 in.	10,000

Four chilled iron discs rotate with minimum friction on sensitive special bearings, giving a prompt, sure indication of whether or not the work is in perfect balance.

Write NOW for full information.

ANDERSON BROS. MFG. CO.,

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A Good Rigid Live Center will increase the cost of your Lathe about 1%; and its value 10%.

. . . "Manufacturing for 30 years without knowing that we needed live centers, until we saw the Rigid. Now we have 10 in use."

"No sir, I never saw a Live Center that would work" said a lathe manufacturer at the Cleveland show in 1935. Now he has sold hundreds on his lathes.

Aeronautical Products, Inc. "We have used Rigid Live Centers exclusively for years and have never seen one of them overloaded. While the same work from a dead center would have melted it."

Not one dollar ever lost on a purchase order.

RIGID TOOL CO., 2000 Witherell St., Detroit, Michigan

list, you'll see my whole plan at a glance."

Across his desk Sevens shoved a couple of large sheets of tracing paper on which the entire shop layout was shown. It was liberally sprinkled with stars that the legend quickly told the G. M. were spots where Sevens intended to place belt grinders. He studied the sheets, one after the other in silence, then, with admiration in his voice, said, "Well, Sevens, you've sure given this some thought, haven't you?"

"That I have," replied Sevens. "I'd a hunch we'd get caught sittin' between a couple of strangers using a marked deck."

The G. M. again became absorbed in the layout, and as his eyes noted the Milky Way of stars, he asked, "But why in the world do you have these belt grinders scattered around so, instead of just in the milling department? Surely they can't be useful in all those places?"

"They certainly are—and then some!" emphatically replied Sevens. "Look here, for instance," he said as he rose, extracted a pencil and used it to indicate on the layout where he had spotted a belt grinder beside a drill press group. "Just the ticket for taking off those cantankerous burrs always left by the drill presses on those link brackets. Yes, I know we've been doing that job on a wheel, but it doesn't leave the flat surface you want, and a belt grinder will."

"You're right," agreed the G. M.

"And I also realize that we tried a couple of belt grinders a few years ago but because of thick belt points they wouldn't do the work, but today's belts on that grinder I saw were perfect," explained Sevens.

Lunchtime came and went as those two schemers went, by way of Sevens' plan sheets, through the plant from one department to another, and although

GOOD NEWS!

for DIE MAKERS

Transfer Points Eliminate Guesswork in Die Making

There's no chance for error when you use transfer screws as markers in setting dies. Points are of uniform height above hex base. Six accurately made and hardened screws nest in a special holder with hex wrench tip. Made in ¼" to 1" diameters.

3/16"	$1.50 per set	5/16"	$1.25 per set	7/16"	$1.40 per set
1/4"	1.20 " "	3/8"	1.35 " "	1/2"	1.50 " "

HEIMANN MFG. CO., **URBANA, OHIO**

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RUSH ORDERS
with these new
FAST ACTION

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TODAY!

WRITE FOR NEW CATALOG,

● Just the thing to speed-up those vital Defense Orders! Cuts circular, irregular, intricate and straight—FASTER, more exacting than all others! No metal distortion possible! Built to stand the gaff on industries toughest jobs! Remember you can "Shear it cleverly with a BEVERLY". Get prices now.

No. 1—cuts 14 gauge—wt. 16½ lbs.
No. 2—cuts 10 gauge—wt. 33 lbs.
No. 3—cuts 3/16 inch—wt. 55 lbs. (Equipped with ball-bearing hold-down device)

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BALL BEARING GRINDERS

for
HEAVY
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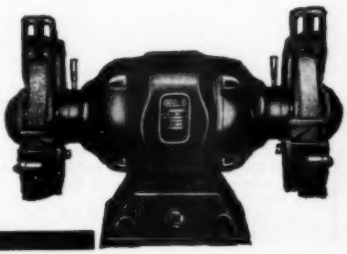
Xtra Heavy AND Excess H. P.

At right, BALDOR Bench Grinder No. 804; 3/4 h.p.; 3440 r.p.m. 220 volt; 2 or 3 phase; 60 cy. 8"x1" Aloxite wheels; heavy 3/4" shaft; enclosed guards; adjustable Tool rests; switch in base. NET WEIGHT, 85 LBS.



No. 804 — Bench Type — $54.00

ASK FOR BULLETIN 89 ON COMPLETE LINE

BALDOR ELECTRIC COMPANY
4368 DUNCAN AVE., ST. LOUIS, MO.

the G. M. was feeling relieved, it still seemed too good to be true.

"But the cost of abrasive belts, Sevens, how does that compare with what we're doing?" he inquired.

"Nothing to it"— eagerly responded Sevens. "Those fellows have some abrasive belts that are plastic bonded and spliced, and I was talkin' to Bert Hanson of Eureka, you know, and he told me these belts had cut their abrasive costs 'way down in the first eight months, so there's no worry from that angle. And another thing, George, the belts can be used either wet or dry, and you'll notice I've put a 'W' alongside some of the stars. That's where we'll put grinders equipped to use wet belts, for from what I saw and heard, this wet belt grinding is a cinch for grinding aluminum and other soft metals. It'll be right down our alley, especially on that Dow metal part V-63. Now you know, George, why I wasn't worrying about delivery of those millers, for we can get belt grinders and have them batting out a lot of work in no time. What d'yuh say?"

"I'll say you're a smart production superintendent, Sevens, but I think you overlooked one bet where the grinders will also save a lot of time and money. Doing plenty of this work freehand, especially those hardware parts and lids, will ease up our jig and fixture requirements and take a lot of work off old Joe's tool room."

"Well, just as it said in that booklet," smiled Sevens, "the utility of these belt grinders is limited only by the ingenuity of the production engineer in designing with them in mind, and the operator in doing the work. And I guess we got some ingenuity left ourselves, haven't we, George?"

Belt grinding is exceedingly versatile in the finishing of small parts.

"I'm beginning to suspect we have," beamed the G. M. "but why waste more time? Let's get this started. I'll tell the purchasing department you'll give them a list of what you need first thing in the morning."

"First thing in the morning," barked Sevens, "they can have it in 10 minutes for it's all made out."

How did this turn out? Well, the first thing everybody knew around Emerald Parts, belt grinders were relieving or supplementing many items of cutting, stamping, casting and drilling equipment in the plant. Schedules were on time, the G. M. happy, and Sevens had more leisure for his favorite pastime.

MODERNIZE PRESENT EQUIPMENT

Russell Boring Bar bores 5/16" to 12" dia. with boring axis parallel to shank axis. One compact tool, with micrometer adjustment.

RUSSELL BORING BAR CO.
Middletown, Ohio

The Future

Non - defense industries must plan for "a period, not of months but of years" to get along with much less than their requirements in a long list of strategic materials, Philip D. Reed, chairman of the board of General Electric Co., said recently.

Mr. Reed said that he was expressing "a few personal observations on several points that must be considered in charting the course of any business."

Prime emphasis will be placed on military products for five or more years, he said, and added that "the sooner we accept the fact, the more quickly will non-defense industries adjust themselves to the new conditions."

Mr. Reed predicted that engineers, chemists and designers will develop new products to help absorb the increased purchasing power, allay inflationary pressures, support our standard of living, and keep us at work.

"Manufacturers now engaged in making civilian products," he said, "will do well in their own interests to convert part or all of their operations to defense manufacture." Thirty-two field offices of the OPM, he added, are prepared to help in the selection of defense products suitable for manufacture in various kinds of plants.

The post-war decade will resemble neither the 1920's nor the 1930's, said Mr. Reed, and "I suspect that the war will advance by several decades the trend away from laissez-faire and toward economic integration and industry-wide planning under government supervision."

NEED MORE GRINDING CAPACITY NOW?

COVEL Offers Early Delivery on 6"x18" Surface Grinder for Tool Room Production

Here's a high-speed Hand Feed Surface Grinder now in production for early delivery to defense industries; Covel's contribution to meet the urgent need for a precision Surface Grinder at a popular price. No. 15 has no dogs or feeds to adjust or change—table moves fast or slow at will of operator. This operating flexibility and the high speed set-up of the No. 15 means precious production hours and dollars saved for you week after week. Write, wire or phone Covel NOW for complete information on No. 15 Surface Grinder, price and name of dealer nearest you.

No. 15

COVEL INDUSTRIAL GRINDERS

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Grinding Machinery Since 1874

ANNOUNCING

THE ACCURATE NEW

UNIVERSAL CENTERING

CHUCK...

The New Universal centering chuck converts a drill press into a centering machine. Furnished with a set of bushings and collets for various size center drilling. Accurate and sturdy. Depth adjustment for centers. Write for catalog and prices.

UNIVERSAL

ENGINEERING COMPANY

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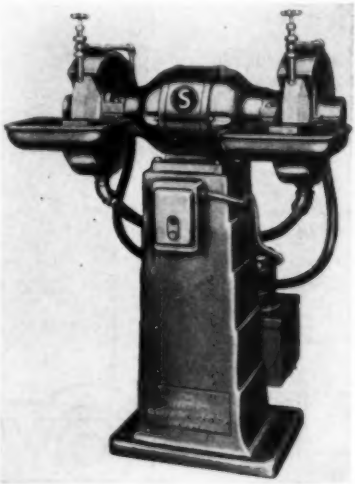
Heavy Duty Wet Grinders

A recent development of The Standard Electrical Tool Co., 1958 W. 8th St., Cincinnati, is a line of 12" and 14" Heavy Duty Wet Grinders.

The arrangement consists of wet grinding hood with integral splash bowl and adjustable work rest. Equipment on each guard includes a valve for controlling flow of water, adjustable nozzle and suitable piping. Bottom of guard trough is fitted with hose connection for gravity return of water to the tank.



A motor driven pump with tank is secured to back of pedestal and suitable piping provided for carrying water to each guard. Pump has a capacity of 10 gallons per minute.

Both grinder motor and pump motor are operated simultaneously through Push Button Safety Starter at front of machine.

The units are also available as Combination Wet and Dry Grinders and it is, optional for the user, whether safety hinge door guard for dry grinding is to be located on left hand or right hand side.

Aircraft

The recent aviation issue of "Fortune" includes an article—"Half a Million Workers"—on how the industry is coping with the biggest labor problem of all times.

Three years ago the building of aircraft required only 30,500 men while today there are over 200,000 on aircraft's payroll. The Bureau of Labor Statistics estimates that by August, employment will exceed 550,000 (including workers in offices, private plane, and accessory plants).

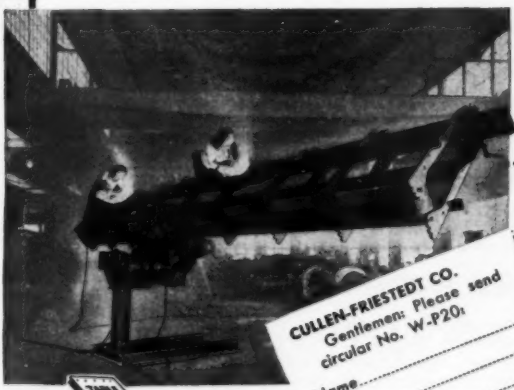
"Fortune" says: —"Before the emergency, vocational training in public and private commercial schools was based on teaching the principle of craftsmanship —would-be machinists spent from two to five years learning the rudiments of all-round, high-skill metal work. But today the short course, engineered for a particular factory, is the backbone of the emergency training program.

"A good example of how a public-school system readjusted its whole philosophy of training is to be found in the Paterson Vocational School in Paterson, N. J. Its problem, training green men in 30 days to take jobs in the high-precision aircraft-engine industry, is tough. B. Bartley Whiteside, Wright's training supervisor, asked that short-course students be taught a few fundamentals:—how to punch a time clock, how to dress in a shop, how to use measuring tools and read Wright operation sheets—and how to operate one production-type machine.

"The course is divided into two parts, one week in the class room, three weeks in the school's shop."

Just ONE set-up for every weld

Save valuable time in welding, handling; do better "down-hand" welding—all with more safety, by using a C-F Positioner. Cut down crane service on large unwieldy work by "setting-up" just once for all welds. C-F Positioners are made in hand and power operated models with a variety of control features suitable for all kinds of work. Send coupon today for complete information about these remarkable welding machines which give every advantage to today's production demands.



Circular No. W-P20 describes C-F Positioners from 1,200 to 14,000 lb. capacity.

CULLEN-FRIESTEDT CO.
Gentlemen: Please send circular No. W-P20.
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Title.....
Address.....

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DYKEM STEEL BLUE
STOPS LOSSES
making dies & templates

Simply brush on, right at the bench; ready for the layout in a few minutes. The dark blue background makes the scribed layout lines show up in sharp relief, and at the same time prevents metal glare. Increases efficiency and accuracy.

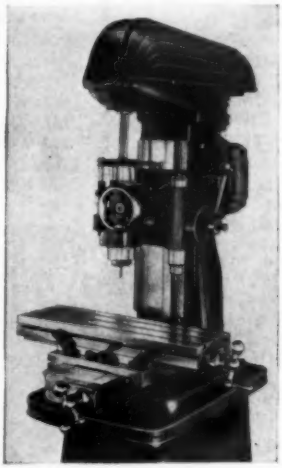
Write for full information.

THE DYKEM COMPANY
2301G N. 11th St., St. Louis, Mo.
(In Canada: 3194 Dundas St., West, Toronto, Ont.)

Vernon Profiling Attachment

A new profiling attachment developed by Machinery Mfg. Co., 1915 East 51st St., Vernon, Los Angeles, Calif., is applicable to the Vernon Vertical Mill and Jig Borer. This attachment provides an easily operated tool for duplicating a wide variety of cavity mold work such as die casting dies, plastic molds, bakelite molds, small drop forging dies and forming dies, and it is highly suitable to production of irregularly shaped small parts.

The taper in the spindle is a No. 1 Morse, and various sized tracers with shanks to fit this taper can easily be made to suit the requirements of the work to be done. Distance between the center of the profiler spindle and the center of the machine spindle is 6", and the profiler spindle has a vertical adjustment of 1", independent of the machine spindle, provided by a micrometer dial graduated in thousandths which gives an accurate means of varying the depth at which the cutter is working in comparison with the vertical position of the point of the tracer where it contacts the master.



The profiler is easy to operate. Master and blank are fastened to the milling machine table, either by fixtures or vises, beneath the two spindles which are equipped with their respective tracer and cutter. Vertical movement of the tracer and the cutter, which act in unison, is controlled by either the hand-lever or the hand-wheel according to the speed of feed desired. The shape or contour of the master is duplicated full size.

A folder with illustrations and complete details is available from Dept. HBB 441 of Machinery Mfg. Co.

Hanna Issues New Catalog

A new catalog (No. 230) has just been completed showing the full line of Hanna Cylinders, together with valuable engineering data, specifications, etc. Also included is helpful information covering Hanna Control Valves and Hanna Hoists.

Copies may be obtained by addressing Hanna Engineering Works, 1765 Elston Avenue, Chicago, on company letterheads.

Forging

Large scale production of aluminum forgings, one of the most vital links in the whole chain of parts needed for military aircraft construction, will be undertaken by Willys - Overland next fall.

It is reported that the plant will have more hammers (48) than any other in the country forging aluminum except the huge forge shop of the Aluminum Company in Cleveland.

The new forging facilities will at first be devoted primarily to fabrication of aircraft parts, but in its long - term planning the Willys - Overland management is not overlooking the tremendous possibilities for aluminum products of all kinds following the peak phase of the defense program. With expansion of private and government-owned plants for aluminum ingot currently aimed at 1,600,000,000 lbs. a year, or five times 1939 output, aluminum someday should be very plentiful for civilian industries.

Ten of the the company's 28 steam hammers, ranging from 1,500 to 10,000 pounds, are now in operation. All hammers will be interchangeable for steel or aluminum work.

Toledo has a good supply of skilled workers, but special training is necessary because aluminum forging is difficult. The new operators must acquire skill of eye and hand greater than that required in the working of steel before they can handle the low temperature aluminum work, according to Vernon R. Drum, Willys-Overland operating manager. He explained that, for forgings of comparable size, aluminum requires hammers three times as powerful as steel. A special machine shop for finishing work will be part of the company's new plant.

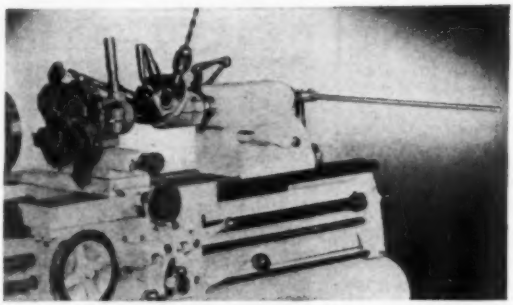
The McGILL bearing - equipped spindles of this Multiple Spindle Wood Carving Machine made by the St. Paul Machinery Company, of St. Paul, Minnesota, operate between 10,000 and 11,000 R.P.M. — convincing evidence of the value built into McGILL products. The McGILL bronze, land-riding retainers are just one of the reasons why machinery builders prefer McGILL Bearings. Ask for complete catalog.

BEARING DIVISION

McGILL MANUFACTURING CO.
1700 North Lafayette Street
VALPARAISO, INDIANA

Turret Attachments for Engine Lathes

Tool - post and tail-stock "turret" attachments are featured by the Jefferson Machine Tool Co., 700 W. 4th St., Cincinnati, Ohio. An adjustable pull - feed is also offered for making tail - stock movement easy and rapid. All three devices are shown in place on the accompanying illustration.



The tool - post turret can be mounted readily on the cross slide or the compound rest of the tool-post carriage. It is asserted that the four tools may be inserted easily and are held rigidly, giving the advantage of "turret" operation.

It is emphasized that the head may be adjusted accurately and quickly to any desired pitch or height in relation to the lathe center. It can be made interchangeable if desired for several lathes. This head is available in two sizes.

The tail-stock turret accommodates five tools and can be attached quickly to the spindle of the tail-stock of an engine lathe. It is emphasized that when once attached, each tool positively centers automatically when brought into action by means of an indexing plunger. Fitting on the outside di-

for Aluminum and its Alloys

For Drawing, Forming and Pressing Aluminum Sheets

No. 22 Nonscratch Drawing Compound is a pigmented compound that has been used for many years by some of the largest airplane manufacturers. It is water soluble and may be used as is or when slightly diluted with water.

No. 4 Aluminum Drawing Oil is a viscous lubricant that does not squeeze out under great pressure when drawing aluminum.

For Machining Aluminum

No. 2 Aluminum Cutting Oil is a very thin oil that provides the necessary lubricating properties to insure the highest type of work—most perfect threads—clean holes, etc.

Write us for samples and service.

Wayne
CHEMICAL PRODUCTS CO.
9446 COPELAND AVE. DETROIT, MICHIGAN

DANLY DIE SPRINGS

MEDIUM PRESSURE
HIGH DEFLECTION

HIGH PRESSURE
MEDIUM DEFLECTION

A COMPLETE LINE TO FILL EVERY DIE MAKING SPECIFICATION

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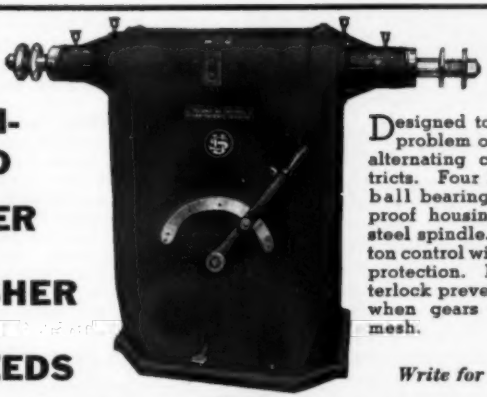
DIE SETS AND DIE MAKERS' SUPPLIES

MODEL
No. 95

MULTI-SPEED BUFFER AND POLISHER WITH 4 SPEEDS



Designed to solve the problem of speeds in alternating current districts. Four heavy duty ball bearings in dust-proof housings support steel spindle. Push button control with overload protection. Electric interlock prevents starting when gears are not in mesh.

Write for details.

THE UNITED STATES ELECTRICAL TOOL CO.

THE GOOD MECHANICS CHOICE

CINCINNATI, OHIO, U.S.A.

SPEED UP Defense Welding Jobs

Even the most inexperienced operator can make a strong weld in less time with the improved ELGIN ELECTRIC ARC WELDER. Unusual ease in striking and maintaining a flexible and obedient arc make this possible.

FEATURES: Instant switching to various heats . . . sturdily constructed for long hard service . . . ideal for fuse welding . . . three models, 150 to 250 amps.

PROMPT DELIVERY

NEW ELECTRIC BRAZING AND WELDING TORCH—Quick release of carbons from holders by remote control. Arc contact and breaking arrangement is operated by thumb levers. Carbons held in firm contact at all times. Complete, with 10 feet of cable, plug-in type connection, and set of carbons. For use on all types of AC welders.

BORM MANUFACTURING CO.
ELGIN, ILLINOIS

FOR ACCURATE DRILLING YOU CAN'T BEAT UNIVERSAL DRILL BUSHINGS . . .

Super-finished bore straight and round within .0001 assures accuracy and unexcelled wearing qualities. Nickle steel lock screws provide extra strength. Cadmium plated screws prevent rusting. Knurled head allows better grip. Black dome improves appearance, resists rust. Write for data sheet.

UNIVERSAL
ENGINEERING COMPANY
FRANKENMUTH · MICHIGAN

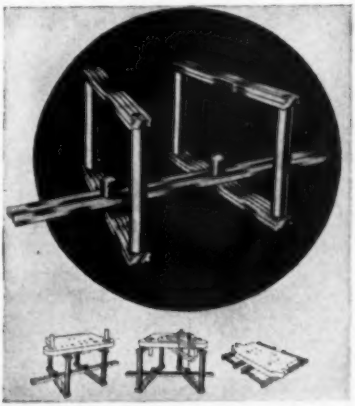
ameter of the tail-stock spindle, this attachment permits such operations as forming, roughing, boring, finishing, drilling, etc. without stopping to change tools.

The tail-stock turret is offered in four sizes from models for small engine lathes up to types for spindles of 3¼" diameter. It also may be adapted to several lathes if desired.

The Adjustable Pull-feed is designed to eliminate the slow movement of tail-stock by the usual hand wheel method. A slight pull on the long lever moves the tail-stock where desired. It can be used on any lathe having 18" swing or less.

Acro Die Cradle

A new and useful tool for die makers is announced by the Acro Tool and Die Works, Chicago. The Acro Die Cradle, as it is called, is, in effect, a universal parallel unit. It is adjustable in length and eliminates makeshift methods for supporting dies, jigs, metal parts, etc., while drilling, counterboring, tapping, milling, or grinding. It is said to be extremely helpful in speeding up production.



The cradle is easy to manipulate, as there are only two thumb screws for quick adjustment to any desired length. The standard height of the parallels is

ERRINGTON MECHANICAL LABORATORY

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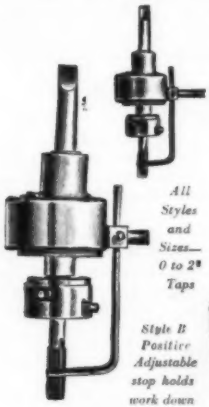
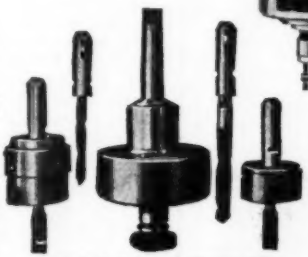
CLUTCH OR CONE DRIVE

Our High Speed Tappers are Super-Sensitive for Small Tapping

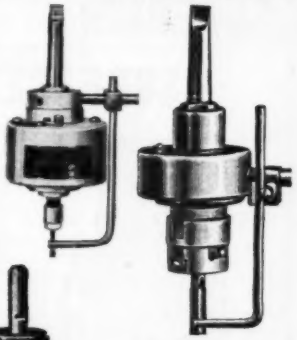


All Styles and Sizes— 0 to 2" Taps

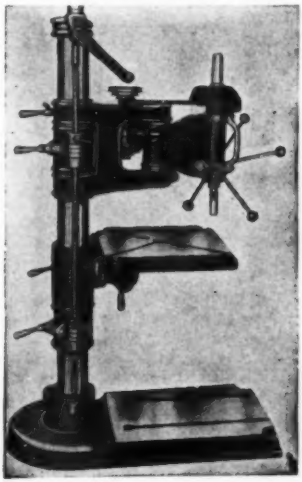
Style B Positive Adjustable stop holds work down



Style D-E, Quick Change Tools



Style C Graduated Adjustable Safety Friction



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Increase Profits . . . Speed-up Production

End Worker Fatigue . . . Increase Efficiency

by using this

DRILLMASTER RADIAL DRILL

Economical in operating and first cost, this floor type, heavy duty, precicion-made, well-balanced Radial offers many features that merit your careful consideration. Drilling to the center of a 36" circle, No. 2 Morse Taper and heavy duty ½ HP ball bearing motor. The full floating, ball bearing spindle assures free and sensitive operation at all speeds.

Send TODAY for bulletin giving full details.

Wm. C. Johnson & Sons Machinery Company

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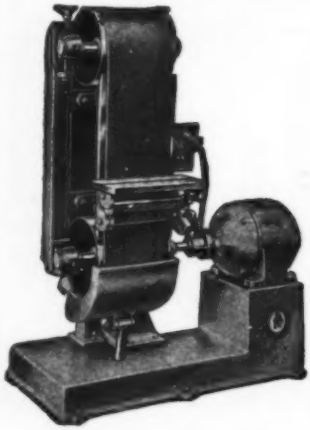
Peerless

SUPERIOR

SURFACERS



Eliminate costly hand sanding and filing. In many cases, a rapid cut on a Peerless may eliminate an expensive milling or planer operation. The advantages of a straight-grained finish and the economies in time and material resulting from use of the abrasive belt method warrant careful consideration of Peerless Surfacing Machines. 4' to 20' width of belt. Vertical and Horizontal. Also Reed High Speed Sensitive Drills and Greenfield Universal Tool & Cutter Grinders.

PRODUCTION MACHINE CO.

GREENFIELD, MASSACHUSETTS

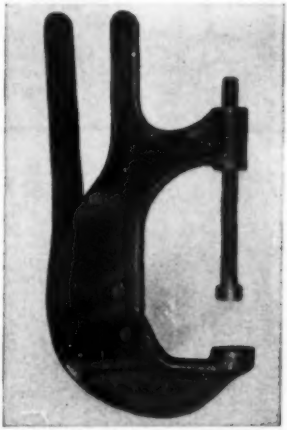
7" and there is an adjustment for lengths up to 20".

The Acro Die Cradle is made of high-grade steel, hardened and ground to close tolerances. It is very sturdy and yet light to move about and the low price brings it well within reach of all tool and die makers, machinists and manufacturing plants of all kinds.

"C" Clamp with One Ton Pressure

Supplementing their original announcement of the Toggle Action "C" Clamp several years ago, Knu-Vise, Inc., announce the "Klampacto" as an improved model.

It is designed for use in the erecting shed, shipyard, round-house or work shop, combining the deep throat of the standard clamp with the tremendous holding pressure of a toggle movement.



Equipped with two handles it is unnecessary to hang onto the clamp and work when fixing it into position; a squeeze of the hand is said to apply it with 2000 lbs. pressure. It is furnished with threaded spindle and lock nut, or patented Kam-Lock adjusting rod for use when arc welding to avoid spatter. The "Klampacto" comes in three models with 5", 6", or 10" jaws respectively.

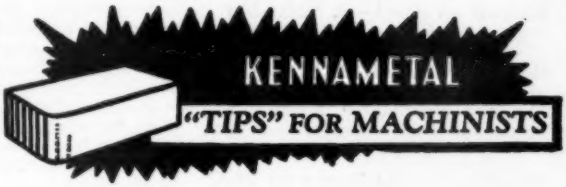
Mechanism

A textbook on mechanism is announced by the American Technical Society, 850 E. 58th St., Chicago. Published at $3.50, "Mechanism" is a companion volume to "Machine Design" by the same author, Prof. Stanton E. Winston of Illinois Institute of Technology. Either book however, can be studied independently of the other.

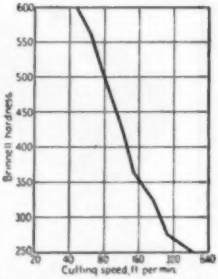
"Mechanism" is a fundamental book relating to the theory of the modifications and transmission of motion. It has been written in a "how - to - do-it" tradition. It goes to the root of all important points and explains them in a clear and practical manner. Difficult points are based on something the reader already knows which allows him to gradually build up his knowledge of mechanism with each new step made easier by careful association with some factor that is already thoroughly understood.

It is asserted that the old troubles associated with the mathematical phase of mechanism have been avoided in this new book, for each mathematical principle is developed by showing the reader how the complete calculation was carried on. The development of the formula, how the conditions at hand are substituted in the formula, and how the solving is done are shown. The author does not use calculus in his explanations.

There are over 250 practice problems, fitting the explanations of the principles. This book is well suited for home study, reference, classroom and national defense training use. It contains 372 pages, 199 illustrations, and is thoroughly indexed. It is durably bound in an attractive washable cloth binding.



Use KENNAMETAL at High Speeds for Maximum Operating Efficiency



Machining speeds with KENNAMETAL on steels of various hardness.

Although the anti-frictional properties of KENNAMETAL permit it to be used at slower speeds than other carbides without "galling" or "picking-up", best results are obtained when KENNAMETAL-tipped tools are used at two to six times greater speeds than high speed steel tools. The graph at the left shows the customary speeds for machining commercial steels, such as SAE 1045, 3140, and 4320, with KENNAMETAL.

Deliveries of standard KENNAMETAL tips are now being made within three to four days upon receipt of order; deliveries of standard and modified standard tools within ten days (except for unusually large orders). Write for Catalog 41 listing specifications and prices of standard tools and blanks.

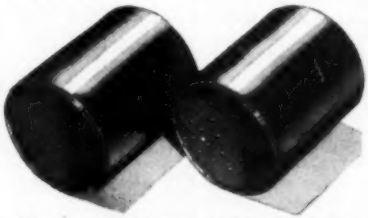
Bronze on Steel—A Valuable New Bearing Metal

The desirable qualities of bronze and steel are said to be successfully combined in a remarkable material announced by the Johnson Bronze Co., 615 So. Mill St., New Castle, Pa.

"Pre-Cast Bearing Bronze on Steel" is reported to be the result of three years of experimentation, testing, and field trials. It is already being used in large quantities in other applications, as well as in bearing work.

The basic purpose behind Bronze on Steel is to combine the bearing qualities of a high grade bronze alloy (S.A.E. 64) with the strength of steel. Bronze on Steel has a higher Brinell hardness than cast bronze and it is asserted to have better bearing qualities than ordinary sheet bronze.

Bearing bronze is cast in solid bars, which unites the metals chemically. Chips drilled from the centers of the bars are reduced to fine powder, treated, and permanently bonded to strip steel.



The manufacture of bearings from Bronze on Steel, in strip form, is essentially a stamping and forming operation, as with other types of sheet metal bearings. Any type oil groove, slot, or hole is easily incorporated. One of the bearings illustrated is ball-indented to retain grease.

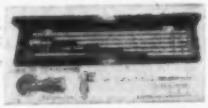
This new material is also available as a graphited bearing. The graphite powder is mixed with the bronze powder before the bonding operation —a method which is claimed to be unusually effective.

In view of the present shortage of strategic raw materials, it is interesting to note that Bronze on Steel uses less copper, tin, and lead than solid bronze of the same composition, helping to conserve these vital metals.

Modern Takes Over Drives and Guards

Modern Motor Drive, Inc., Elkhart, Ind., has taken over, and is now manufacturing the Modern Motor Drive for machine tools, and the Safe-T-Guards for protecting press operators formerly made by Quality Hardware & Machine Co., of Chicago.

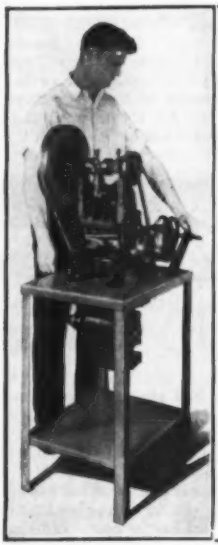
NEW PRECISION INSIDE MICROMETERS
Nice Workmanship—Highest Accuracy



1½-6"-1½-12" with bakelite case. Workmanship and accuracy unconditionally guaranteed.

New TELESCOPE GAUGES—Nicely made Set of 3, ½"-2½", in leatherette case
Write for descriptive literature.

PACIFIC TOOL & SUPPLY CO.
342 No. Vermont Ave., Los Angeles, Calif.



FLEXOPRES

Cuts production materials in uniform lengths up to 9 inches—wire, insulation, spaghetti tubing, tape, cloth, paper, and light metal.

Punches and forms small light parts such as clips, connectors, lugs, springs, etc.

Perforates continuously light metal, paper, cloth, foil, etc.

HIGH SPEED AUTOMATIC

MOST SALES THRU USERS

FLEXO MACHINES
821 W. ERIE ST., CHICAGO

Surface Protection

A new protective coating material known as "Miccroplastic" has been introduced by the Michigan Chrome & Chemical Co., 6346 East Jefferson Ave., Detroit, Michigan. This new material is claimed to provide complete chemical resistance to all acids and plating solutions, alkali cleaners and petroleum spirits.

It is said to offer exceptional adhesion to every portion of any metallic surface it covers, regardless of shape or size of plating rack, anodizing rack or other object which is coated. Even when portions of the coating are removed, the solution does not creep behind the coating and contamination of baths by chromic acid which might be trapped under the coating is eliminated. It is asserted to be safe to go from bright nickel to chrome without reracking the work.

The coating is said to provide the flexibility of soft rubber and be free from cracking. Even when contact wires are flexed or when the entire rack is twisted and bent, coating surface remains intact.

The material is very free-flowing. It is dipped easily—one dip requiring as

A Time Saver

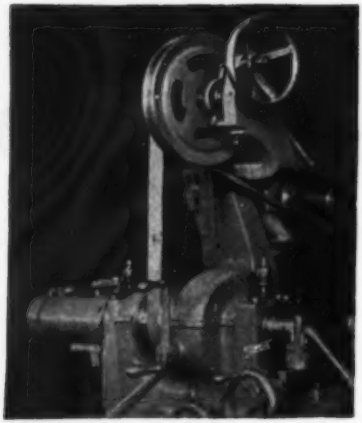
★ ★ ★ **A Precision Grinder For Tool Room and Die Shop**

Boyar-Schultz Profile Grinder No 2 is a machine tool used to shorten the time in grinding and fitting irregular shapes and curved surfaces in cams, templates and in this case, LARGE DIES AND PUNCHES.

With two motors and two independent oscillating spindles operating at 10,000 R.P.M., this Profile Grinder will handle work of the most complicated kind, either from above or below.

WRITE US FOR LITERATURE

BOYAR-SCHULTZ CORPORATION
2106 WALNUT STREET, CHICAGO, ILLINOIS



Given Vari-Speed Motor Drive operating on No. 4 W & S Turret Lathe

UP SPEED RANGE 30%

A Given Vari-Speed Motor Drive on an old machine tool gives you both 30% increased speed range and infinitely variable R.P.M. control. No belt shifting. No gear shifting. No tool marks.

The Given Vari-Speed Drive steps up old machines to modern production standards with proper speeds for tungsten carbide tools. Add years of profitable life to tools now considered obsolete. Do it now, as Given Vari-Speed Drives are ready for immediate delivery in types to fit any machine tool. Four bolts to install. 1 to 7½ h.p. Sold on approval. Money back after 60 days if not entirely satisfactory. Send for Bulletin.

Given Machinery Company
2016 Santa Fe Avenue
Los Angeles, Calif.

GIVEN VARI-SPEED DRIVE

little as five seconds for submersion and emersion, following every contour without webbing, bridging or air pockets.

The solution contains high solids; it dries to a high gloss which makes rinsing between baths extremely easy; and it is an excellent and permanent coating for hard chromium plating racks.

Application of the material is very simple and the only equipment that is required is a small, inexpensive dipping tank and a baking oven. The coating is applied directly on the metal surface, which must be thoroughly cleaned. Dipping is by hand. Mechanical dipping equipment is not necessary. After quick submersion and emersion, racks are allowed to air dry for about ½ hour and are then baked for one hour at 225° F. Seven coats per rack are recommended.

The illustration shows the dipping method, how racks are hung for air-drying, a typical baking oven and containers in which Micrroplastic is supplied.

Rawlplug's New Catalog

Catalog No. 41 has just been issued by The Rawlplug Co., Inc., 98 Lafayette St., New York City. It covers extensive and valuable data, charts and tables on expansion Anchors.

It also contains complete data on each and every type of anchor made by the Company, together with a list of uses and other engineering data. It is of handy pocket size.

BREMIL MFG. COMPANY
1700 Pitts. Ave., Erie, Pa.

ALL-ALLOY compound lever strap cutter. Cuts 1½ strap with one stroke.

Selling Uncle Sam

How can a business man sell to the government?

Jesse Jones, Secretary of Commerce, early in his administartion set up a Service and Information Office staffed by experts.

This office is equipped to inform manufacturers whom they should contact and exactly how to do so. A manufacturer who desires to cooperate with the government in the present emergency, and lacks specific information as to how to proceed, is invited to apply to this unit, room 1060, Department of Commerce, Washington, D. C.

Many manufacturers apparently have felt that if they desire to transact business with the government they must either come to Washington in person or employ somebody familiar with government purchasing methods. The Service and Information Office strongly urges manufacturers not to come to Washington, at least until they have carried on preliminary negotiations by mail.

They are advised not to employ outsiders on a commission or other basis. Furthermore, the Army, for example, has decentralized its purchasing system. Different depots specialize in purchasing specific supplies. The Navy, too, has part of its purchasing system decentralized and prefers to have preliminary negotiations conducted by mail.

The Procurement Office of the Treasury Department is a centralized purchasing agency for all departments except the Army and Navy. This Office has branches in different parts of the country. When it is necessary to come to Washington, the Service and Information Office will gladly make arrangements.

• Your lubrication problems, whether large or small, will find the correct answer in the Gits Line. If your requirements are of special nature, send us your specifications.

GITS BROS. MFG. CO.

1860 South Kilbourn Ave. Chicago, Ill.

30 years of oil cup experience

RECLINABLE POWER PRESSES

We manufacture a complete line of mechanical power presses, with sizes and types for every need in your shop.

Write for bulletins.

ZEH & HAHNEMANN CO.
Newark, New Jersey

NIELSEN
Heavy Duty
Live Centers

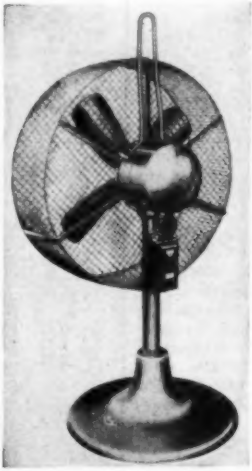
Write for catalog on live centers

Adapted for heavy duty work. Precision type ball and roller bearings assure maximum capacity for high speed production and long service.

NIELSEN, INC. LAWTON, MICH.

Heavy-Duty "Man Cooling" Fan

A new 36" heavy-duty Portable Floor Fan which hurls a tremendous blast of air in a straight line is offered by the ILG Electric Ventilating Co., Chicago. Self-contained, completely equipped and ready to handle any heat problem,



it is especially valuable in "man cooling" capacities. A 90-foot blast of cooling, refreshing air cuts right through "hot spots," closely confined departments and hot-air pockets.

Equipped with a cast-iron base of extra-heavy construction, the fan has a very low center of balance. It can be safely moved on a scoop truck, and a hook is also provided so that it can be moved by a crane if desired. A starting switch completes the equipment on the fan.

The propeller is of the four-blade type, of one-piece metal construction, keyed to the motor shaft. Heavy steel mesh guards cover the fan in front and back.

The 36-inch heavy-duty model weighs 675 pounds, attains 1140 r. p. m., and circulates air at a rate of 24,000 cu. ft. per minute. The overall height is

REMOVE BROKEN TAPS

Quickly—
Insert WALTON Tap Extractor and back out broken piece. No annealing—no drilling.

Easily—
Tap Extractor and Tap Wrench are only tools needed.

Safely—
Threads are not damaged. Not necessary to tap oversize after broken tap is removed.

Folder 131 gives complete details.

The Walton Co.
95 ALLYN STREET
HARTFORD, CONN.

Accurate Repeat Readings

from built-in quality and rugged construction

Model E Indicators

Waltham Dial Gage Co.
STOW, MASSACHUSETTS

TO MAKE THIS SAW TAKES A LOT OF KNOW-HOW!

IF YOU USE PROFILE SAW, you are directly concerned with its quality. A ribbon of steel that will slice through armor plate 10-or-more inches thick has to be good. And how to make it wasn't learned overnight.

For instance, you must know steel. You must know how to design teeth, how to mill them clean and true, and how to set them. Then there is that tricky art of heat treating — one error and the saw is ruined. There are literally hundreds of tricks in this trade, but only one way to learn them —the hard way!

Milford's know-how was learned during more than 50 years as the originator and world's largest producer of Profile Saw.

If you are not in the army of satisfied users, enlist today. Write for free sample, giving specifications of saw you now use, and make of your machine.

Mill Supply Distributors now carry Milford Profile Saw in stock. All wanted sizes are as close to you as your telephone.

THE HENRY G. THOMPSON & SON CO., NEW HAVEN, CONN.

MILFORD

PROFILE SAW . . .

for all contour-sawing, jig and bandsaw machines.

MAKERS OF
REZISTOR HACKSAW BLADES

Screw Machine Cams

IMMEDIATE DELIVERY

BANNER MANUFACTURING CO.
1671 Clybourn Ave. >: Chicago, Ill.

Standard Since 1911

L&J

INCLINABLE POWER PRESSES

L & J PRESS CORP.
successors to Lathbouth-Jordan Tool & Machine Co.
1625 STERLING AVE ELKHART, INDIANA

67". The guard diameter is 43", the base diameter, 32". Other models of the "man cooling" portable floor fans, with the same general features but not of extra-heavy construction, are available in sizes of 36, 30, 24, and 12".

Floating-Shaft Coupling

A new floating-shaft flexible coupling employing the L-R principle has been recently announced by the Lovejoy Flexible Coupling Co.,

Designated as L-R Type HKQ, it is applicable to either horizontal or vertical drives, and is recommended for the longer distance drives where the space between the driver and driven units cannot be successfully handled by standard couplings; and especially where there is excessive misalignment.

The floating shaft is supported in fixed bearings, entirely independent of the power-transmitting elements.

An outstanding feature of the new Coupling is the speed with which it can be dis-assembled. The operation requires merely the reversal of three to five driving bolts. This reversal automatically pulls the coupling bodies away from their adapters, creating a gap which permits the collapsed center assembly to be lifted out.

Either of the coupling bodies mounted on the fixed shafts may be used as a sheave, or part of a sheave, for V-Belt drive. Removal of the floating shaft makes removal or replacement of the V-Belt possible without disturbance of the connected machines.

Couplings are made in standard sizes, with bores from 1-½" to 8-½" (7 to 800 h.p. at 100 r.p.m.), for various distances between fixed shafts, and for handling extreme misalignment.

SHARPLY DEFINED *Scribed Lines*

Micro *Supreme*

LAY-OUT DYE

Manufactured by

MICHIGAN CHROME & CHEMICAL CO.

6346 E. Jefferson Ave., Detroit

Be Sure to Take Advantage of This Special

TRIAL OFFER

60c

TO HELP YOU TEACH THE NEW GRINDER HAND

how to get maximum service from your Diamond Tools—we have some effective training material. Send for it. No obligation.

KOEBEL DIAMOND TOOL CO.
9352 Grinnell Ave., Detroit

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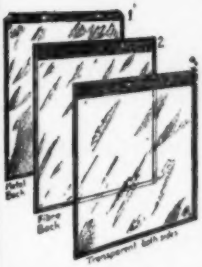
DIAMOND TOOLS

Multi-Point, Multi-Set, Multi-Edge, and Single Set. Diamonds for All Industrial Purposes.

Protect Shop Orders, Drawings, Blueprints...



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Send for folder and quotation.

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1422 E. 109th St., *Cedar 4728,* Cleveland, O.

Economical Live Ball and Roller Bearing Centers are going to play an important part in our National Defense Program.

FOR LATHES, HAND SCREW MACHINES, GRINDERS and MILLS

The features that interest you most:

1. Simplicity, sturdiness, and heavy duty.
2. 50% more radial load carrying capacity than the average live center.
3. Large spindle, small head, short overhang, most desirable for rigidity and to be free from chatter.
4. With the aid of cap screw you can lock spindle to redress point right in your machine.
5. Special oil seal to retain lubricant and keep out foreign matter.
6. A compression pad to compensate for heating and expansion of metal as a safety factor, with reasonable diligence exercised.

A folder giving prices and complete detail will be mailed to you upon request.
A ten day trial. If not perfectly satisfied your money will be cheerfully refunded.

MOTOR TOOL MANUFACTURING CO., 12282 TURNER AVE. DETROIT, MICHIGAN

Diamond Tools

In Superior Settings

Golconda Diamond Tools are made with superior settings—forged steel, alloy and sintered settings.

SINGLEPOINT tools in three qualities, in all sizes are furnished in any type holder.

GOLCONE diamond points cone shaped to 60°, 90° and 120° angles are securely held in forged settings.

POLYPOINT diamond tools are set in a special alloy matrix at low temperatures under controlled atmosphere eliminating oxidation and fully preserving the original hard skin surfaces. The POLYPOINT tools have 3 or 7 stones symmetrically arranged for highest efficiency and lowest cost per dressing. In either design, there are 3 diamonds cutting at all times. This assures better truing and dressing of wheels.

We have been Industrial Diamond Tool manufacturers for more than 18 years. You can benefit by our experience. Engineering help available; send for literature today.

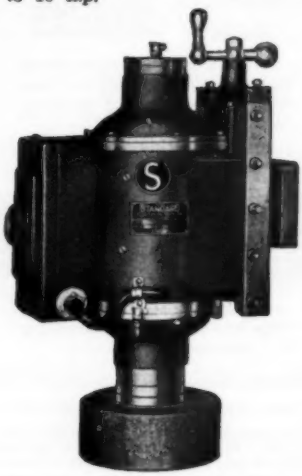
Immediate delivery on standard tools.

Golconda Diamond Products Corp.

2214 W. Armitage Ave., Chicago, Ill.

Vertical Spindle Grinder

Providing convenient means of converting planers or boring mills into grinding machines, The Standard Electrical Tool Co., 1954 West Eighth St., Cincinnati, have developed a line of Vertical Spindle Grinders in sizes from ½ to 10 h.p.

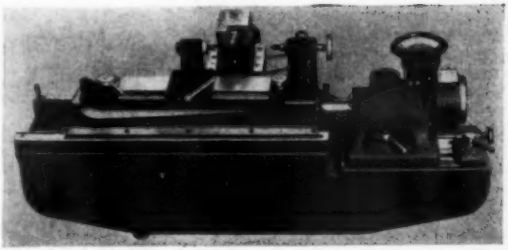


The sizes from ½ to 3 h.p. are available only for operating at 3600 r.p.m. using up to 6" diameter cup grinding wheel, while the larger sizes are available with 3600, 1800 or 1200 r.p.m. motor speeds using suitable diameter cup grinding wheels up to 12" diameter. For periphery grinding, wheels may be in sizes up to 14" diameter.

The machine illustrated is equipped with vertical feed and integral mounting pad to coincide with the dimensions taken from the planer or boring mill. This grinder is available without feed, or with both vertical and horizontal feeds. On some types of boring mill applications a special mounting arrangement is available to permit securing the grinder in the ram of the mill.

Complete details on this machine are contained in the manufacturer's new Catalog No. 43.

Pratt & Whitney Lead Tester



A new lead tester is offered by Pratt & Whitney which is reported to provide greater accuracy, speed, range and flexibility in checking thread leads. It is exceptionally heavy and sturdy, occupying a bench space 37" x 17", and is 15" high. It will handle parts up to 4¾" in diameter, with a thread length of 4" and an overall length of 8". The measuring head is identical with the one on the same company's Standard Measuring Machine except that the microscope is omitted. It will read accurately within .000025". Taper threads as well as straight threads may be checked by correctly positioning the swivel work supporting table. It belongs in the class of basic measuring equipment, and is a direct reading instrument, not a comparator. Regular equipment includes one each 4", 3", 2" and 1" Hoke Precision Gage Blocks, and a set of 7 ball points for 4 to 80 threads per inch. Complete information is available upon request.

Norgren Oiled Air Products

Catalog No. 400 is announced by the C. A. Norgren Co., Inc., 214 Santa Fe Drive, Denver, Colo.

"Lubro-Control" units are completely described and listed in this new general catalog. They are based on the principle that a thin fog of oil in the air driving an air tool is an excellent means of lubrication. A wide variety of types and combinations is listed, along with various related items such as valves, hose, regulators, etc.

Oiled air lubrication of high speed spindle bearings is emphasized. This method is claimed to be especially successful as applied to high speed grinder spindles.

SCHAUER Speed Lathes

Variable Speed

Ideal for lapping, filing, polishing small metal and plastic parts.

Write for Catalog 400.

Schauer Machine Co.
2064 Reading Rd.
Cincinnati, Ohio

BREAK BOTTLENECKS

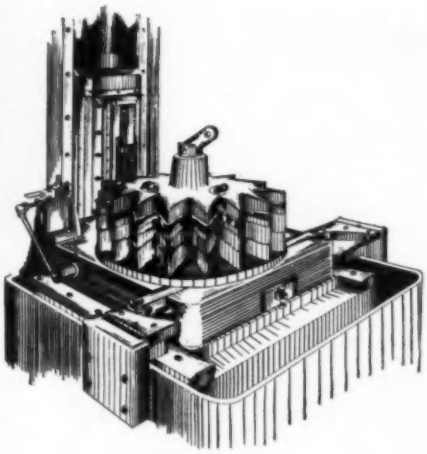
In National Defense Production with QUADRUPLEX lathe apron stops and tailstock turrets. Their low cost, universal adaptability, and ease of attachment, make QUADRUPLEX an ideal multiple production combination. Send for prices today, and save time, and tooling cost.

Dept. B 1 SPECIALTIES MANUFACTURING COMPANY INC.
35 FARRAND STREET, BLOOMFIELD, N. J.

Broaching Sprockets for Tanks

Rapid and low-cost finishing of large sprocket teeth in a single operation from the rough cut steel plates or castings is possible with the set-up shown. Crawler sprockets for track - laying tractors, military tanks, etc. can be accurately broached, several at a time, by a single pass of the broach.

The platen of the Colonial broaching machine is equipped with an indexing table on which the sprockets are located, after boring hole for the hub. Teeth of the sprockets may first be roughed out by flame cutting if made from steel plates. If production is large enough, the machine may be arranged for automatic indexing. As will be noticed, only a single broach is required for finishing the ajacent faces of each tooth well within the limits necessary for parts of this kind.



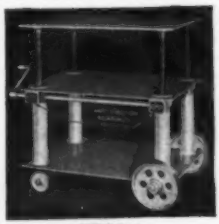
This installation was designed for use with a single ram type broaching machine of 25 tons capacity, and 66" stroke, equipped with indexing table. It convinced two companies of the economies in time and cost of using broaching for variable porduction lots ranging from a few to numerous pieces of this type.

A New Weltronic Switch

Designed to eliminate the necessity of an air or hydraulic pressure switch in resistance welding and to provide accurate timing control for any air-operated stationary or portable single or multi-spot welder, the Model 75 electronic tube-type timer is added to the line of timers and controllers manufactured by Weltronic Corp., 3069 East Outer Drive, Detroit, Mich.

Featuring a minimum of moving parts as well as eliminating need of a pressure switch, Model 75 insures a minimum of maintenance costs with down time virtually eliminated, it is said.

Using a repeating timer to eliminate the need of a pressure switch requires



STYLE A

The **HAMILTON PORTABLE ELEVATING TABLE—"PORTELVATOR"**

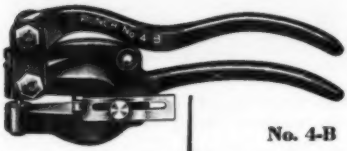
No strained backs or bruised fingers if you let the Hamilton "Portelvator" do the lifting for you.
Use it as means of support—Use it to level large overhanging pieces of work—Use it as a bench to work on—An economical and efficient helper—One to twenty ton hand or power operated.

Write for full details today.

THE HAMILTON TOOL COMPANY
Ninth and Hanover Streets, HAMILTON, OHIO

CHANNEL

No. 8-B



No. 4-B

WAN

The Sign of QUALITY

Our registered Trade Mark appearing on all our tools, punches and dies is our pledge of DEPENDABLE QUALITY and our guarantee that the tools will give entire satisfaction.

W. A. Whitney Channel Iron Punch shown above makes a ¼" hole in ¼" iron. The No. 8-B punches a ¼" hole in ⅛" iron. No. 4-B — ¼" hole in 16 gauge iron.

Send for our catalog today.

It lists the complete line of W. A. Whitney Punches in every type and size to meet your need.

W. A. WHITNEY MFG. CO.

ROCKFORD, ILLINOIS

ON GUARD *against* *Production Loss* with PRODUCTIMETERS

Electric Model 5-D1-MF (left) is ceaselessly on the job, giving *accurate count* for economical, efficient production control. It's ideal for counting small pieces, parts that must not be marred, articles too light in weight for mechanical contact. *Especially* adapted for use with Photo-electric Relays.

Full details in Catalog 16.
Send for your copy today!

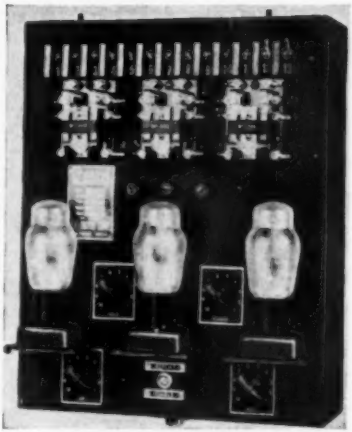
There's a Productimeter for every industrial need. Write us for assistance on your counting problems.

DURANT MFG. COMPANY

1928 N. Buffum St.
Milwaukee, Wis.

180 Eddy Street
Providence, R. I.

one additional timing function. The four adjustments required are: "Squeeze" time, "Weld" time, "Hold" time and "Off" time. The "Squeeze" time is the interval between the instant initial welding pressure is applied and welding current is "on", which allows sufficient time to permit full welding pressure to build up before welding current is applied. Thus, the timer will compensate for the effects of lowered



room temperatures or extreme distance from pressure switch to welder.

The four adjustments are made by "dialing" control knobs on front of panel. The wide range of optional time selection from 2 to 30 cycles in close steps is sufficient to provide accurate timing for almost any stationary or portable, single or multiple spot welding operation where air or hydraulic pressure is used. Single weld or automatic repeat operation is optional to suit the work.

Oil-Less Bearing List

A New Die List on Compo Oil-Retaining Porous Bronze Bearings has been issued by Bound Brook Oil-Less Bearing Co., Bound Brook, N. Y.

An attractive feature of the list, which covers Sleeve, Flanged and Thrust Bearings, is the fact that "Length Sizes" are specified — "Any Length Up To." Although a large number of sizes of dies is listed, the actual number is multiplied by the fact that intervening lengths between the sizes specified can be ordered. In other words, lengths can be varied up to the maximum lengths specified on each size in the Die List.

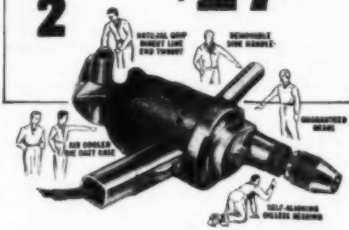
NUMBERALL
Numbering Machines
Automatic and Hand Operated
for stamping in Metal, Fibre, Plastics, etc. Do faster and better work than Single Steel Stamps.
For Marking Metal Parts, Name Plates, Metal Checks, etc.
Write for Catalog.
NUMBERALL STAMP & TOOL CO., Inc.
Huguenot Park, - - - Staten Island, N. Y.

Tapping As Fast As You Can Drill . .
with the A. M. Sensitive Tapping Machine . . . from the smallest and finest up to 7/16" diameter in steel and iron—and up to 1/4" in softer materials. A modern unit that within its capacity, will take all the punishment intense production can inflict.

Write TODAY for this sure solution of your small tapping problems.
A. M. MUEHLMATT DIVISION
OF
THE HAMILTON TOOL CO.
Ninth and Hanover Streets,
HAMILTON, OHIO

SpeedWay

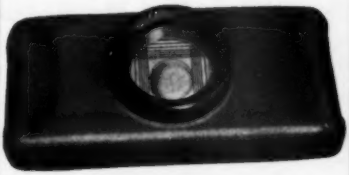
1/2" DRILL $27.50



This full capacity, industrial ½" Drill is handier, more powerful and an all-around better drill than many costing a third more. Specially wound high torque, forced-air cooled motor. Improved "natural grip" end and breastplate handle applies thrust directly behind drill point—and all quality features—oilless bearings, streamlined die cast case, etc., etc.

SPEEDWAY MFG. CO. 1822 S. 52nd Ave., Cicero, Ill.

FELL Precision Level



A precision "all-way" level for use in machine tool building, setting up and maintenance, whether for establishment of level working surfaces or for the accurate checking of straightness where true level itself is not required.

Graduations are in .0005" per foot and form squares about a circular bubble, thus giving coordinate readings and showing the direction and amount of slope, if any.

Write TODAY for bulletin giving full details.

Wm. B. FELL COMPANY
700 South St., Rockford, Ill.

SHELDON Back Geared Screw Cutting PRECISION LATHES

1" Collet Capacity—
Ball or Roller Bearing

No. BB U-1136 WQ Sheldon 11" swing 36" between centers pre-loaded ball-bearing spindle, hardened and ground all over, inside and out with 1⅜" hole thru center, hand scraped bed, ways (2 V-ways, 2 flat ways) full quick change gear box, worm feed apron with power cross feed, thread chasing dial and 4-speed lever operated underneath pedestal motor drive, and telescopic taper attachment.

Write for Catalog showing complete line of Sheldon Precision Tool Room and Manufacturing Lathes, attachments and accessories; Sheldon Arbor Presses and Sheldon Drill Press and Machine Vises.

● SHELDON MACHINE CO., Inc., 1629 N. Kilbourn Ave., Chicago, Ill., U.S.A.

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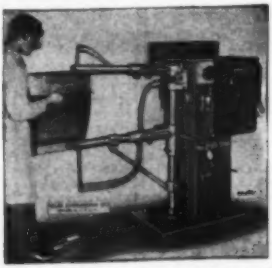
Your Welding Problem

We manufacture a complete line of ELECTRIC SPOT WELDERS from ¼ to 250 K. V. A. for welding:



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- Aluminum
- Bronze
- Stainless Steel
- Galvanized Sheets
- Monel
- Molybdenum
- Tantalum
- Nichrome
- Tin Plate
- Copper
- Nickel
- Silver
- Gold, etc.

There is an EISLER WELDER for every purpose.

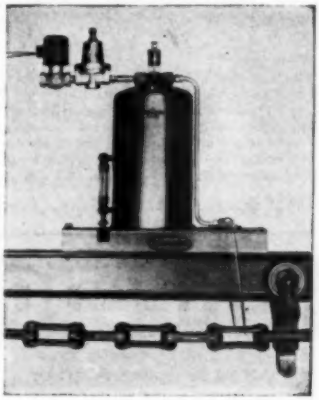
Butt Welders to weld from .010" to ½" dia. metal. We make all kinds of Standard & Special TRANSFORMERS. A. C. ARC WELDERS—100 to 400 Amps. SPECIAL SPOT WELDERS to Specifications. LARGE or SMALL QUANTITY CONTRACT SPOT WELDING.

WRITE FOR INFORMATION

CHAS. EISLER
EISLER ENGINEERING CO.
752 So. 13 St. near Avon Ave., Newark, N. J.

Lubricating Conveyor Chains

To overcome the problem of lubricating the chain links of conveyors passing through ovens, kilns and other hot zones, J. N. Fauver Co., Inc., offers an automatic conveyor chain lubricator. In a typical case, the chain of a 250-ft. conveyor, designed to travel at the rate of two feet per min. through a firing kiln, "froze" frequently when passing over driving and idling sprockets, resulting in changing speed of chain travel and uneven firing of the ceramic products passing through the kiln.



The lubricator consists of a 2-gallon tank with an air regulator set at 80 lbs. pressure for effective control and operation of the outfit. The air, passing through the lubricator, picks up a predetermined and adjustable amount of lubricant and delivers it, in the form of an oil fog, through ⅜ in. o. d. copper lines to both sides of the chain links. Acheson-Colloidal Graphite is used and is so mixed and controlled as to insure each chain pin being lubricated for its entire length every trip and yet leave no excess to cause drip. The spray of lubricant is adjusted readily to conform with kiln temperature and chain speed. The action is entirely automatic. An electric solenoid valve on the lubricator inlet line is wired to the

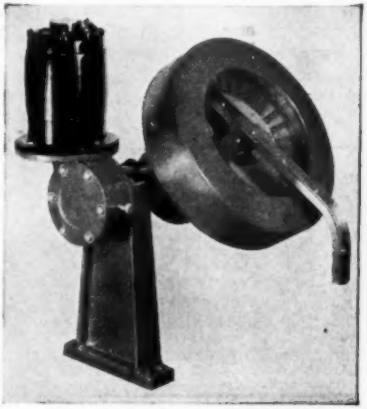
HOPPERS

MOTORIZED HOPPER UNITS

ADAPTABLE TO
PRESSES, THREAD ROLLING AND SLOTTING MACHINES, CENTERLESS GRINDERS AND SPECIAL MACHINES.

FEEDS:- RIVETS, NUTS, SCREWS, PINS, PLAIN WASHERS AND SPECIAL PARTS ADAPTABLE TO HOPPER.

SEND SAMPLES

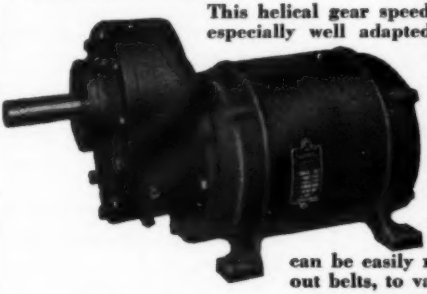


DETROIT POWER SCREWDRIVER CO.
5363 ROHNS AVE., DETROIT MICH.

Janette Speed Reducers

FOR YOUR SLOW SPEED MACHINE TOOL DRIVES

1/50 to 10 H.P. **.08 to 1140 R.P.M.**



This helical gear speed reducer, one of 19 styles, is especially well adapted for driving thread millers, gear hobbers, punch presses, shears, keyseaters, planers, etc.

A reducer of this design can usually be mounted at the back of the driven machine. The gear head can be rotated to obtain correct belt clearance. Janette reducers are available with flange mounting bases and long countershafts, which can be easily mounted and connected, without belts, to various kinds of machine tools.

SEND FOR OUR 100-PAGE CATALOG

Janette Manufacturing Company
558 West Monroe Street Chicago

starting switches of the chain drive motors so that the lubricator starts operating the minute the conveyor starts.

The lubricator produces even firing and is claimed to effect economies in lubricant, a reduction in maintenance costs, and an important saving in down time due to conveyor stoppage.

THE PRECISION UNIVERSAL TOOL HEAD

brings all adjustments under absolute micrometric control of the operator without stopping tool or machine. In Jig Borer, Milling Machine or Horizontal Boring Mill, it bores, faces, counterbores, turns outside diameters, mills flat surfaces and slots, under-cuts, recesses, back-faces and does an almost limitless range of "headache" jobs. Send for bulletins. Address all communications, inquiries and orders to

THE PRECISION TOOL COMPANY
P. O. BOX 155, BROOKLYN, NEW YORK
Cable Address: "Pretool-New York" Tel: MAin 4-1064

Plastic Protection for Metals

Marlox, a plastic coating for metals, is being introduced to the industrial market by Marley Chemical Co., 983 East Milwaukee, Detroit, Mich. For protection against rust, corrosion and rot, it has long been known that certain plastics meet the most severe tests with regard to saltspray, humidity, acids and other attacks, so much so, that they almost approach the protective qualities of ceramics, without the disadvantages of these hard porcelain enamels.

Marlox is a plastic coating of the structural type—used either as a priming coat, or purely for protection against rust and corrosion.

Chief among many advantages claimed is almost complete absence of porosity, as compared with coatings made from oils and pigments. Too, this product is said to exclude the air film present in such materials. It is applied by spraying, painting or dipping, forming a thin, flexible coating on any metal to which it is applied—so

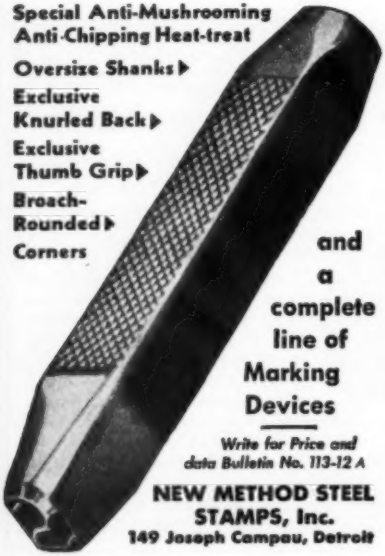
Special Anti-Mushrooming Anti-Chipping Heat-treat

Oversize Shanks ▶

Exclusive Knurled Back ▶

Exclusive Thumb Grip ▶

Broach-Rounded ▶ Corners



and a complete line of Marking Devices

Write for Price and data Bulletin No. 113-12 A

NEW METHOD STEEL STAMPS, Inc.
149 Joseph Campau, Detroit

—GEARS—

Spur—Helical—Worm—Bevel—Miter, Etc.

We do broaching and all kinds of grinding.

We specialize in grinding hardened steel bushings, cam rollers, etc.

Prompt service and quality has retained a large list of customers for 25 years.

TAYLOR MACHINE CO.
1919 E. 61st St., Cleveland, Ohio

for Speedy, Low Cost Pot-Hardening and Melting — Use This

JOHNSON Furnace 550

The compact unit that reduces operating costs for salt, cyanide, lead hardening and heat-treating. Furnished with lid, derrick for lifting lid, steel pot and Johnson Blower. Tool, die, and model makers specify Johnson No. 550 for melting small quantities of aluminum and nickel-silver. Gas consumption is very low.

Available in larger sizes. Send your specifications for quotations.

Our 40th ANNIVERSARY YEAR

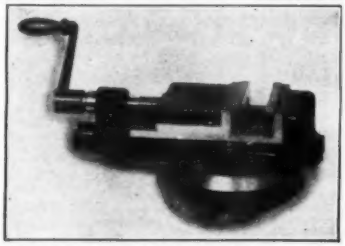
JOHNSON GAS APPLIANCES FOR EVERY INDUSTRIAL PURPOSE

FREE

New 20-page Catalog of money-saving Gas Appliances. Write for yours.

JOHNSON GAS APPLIANCE CO.
602 E. AVE. NW., CEDAR RAPIDS, IOWA

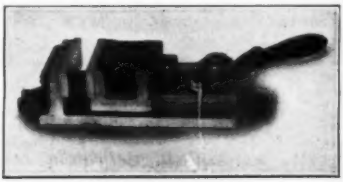
The Modern Swivel Vise



Base graduated in degrees
Alloy steel hardened screw
Hardened & ground jaws
Made in several sizes
Weight 36 pounds

List Price $40.00

The Modern Quick Acting Cam Vise



All steel parts hardened
Hardened alloy steel screw & handle
Hardened & ground jaws
Semi Steel castings thruout
Made in two sizes
Weight 20 pounds

List Price $35.00

Manufacturer of high speed steel and carbide cutting tools.

MODERN TOOLS, E. Berlin Conn.

EVANS *High Speed Steel* **REAMERS**

LOOK AT THESE FEATURES

- No honing.
- Will not chatter.
- Chrome-like finish.
- Perfect alignment.
- Full bearing surface.
- Left and right spirals.
- 50 to 80 thousandths expansion.
- Cannot fall in slots or oil grooves.
- Extension pilots for line-up work.

WILL SHIP ON 30 DAY'S TRIAL | **EVANS FLEXIBLE REAMER CO.** Ravenswood & Wilson Ave., Chicago, Ill. | WRITE FOR CIRCULAR

flexible that it is not affected to any noticeable degree by temperature changes. The same quality of flexibility, plus unusual adhesion, makes Marlox of particular value in coating welds. Here it furnishes adequate protection against corrosion and rust-creepage in the seams and folds, right up into the welded spot. As a base coat, Marlox provides a tough, durable bond between metal surface and any kind of finishing coat.

Marlox dries quickly, and can be handled in five to ten minutes after applying. One hour's drying time is recommended where possible, before applying enamels or paints. It may be applied to all types of metals and alloys including steel, cast iron, aluminum, aluminum alloys, magnesium alloys, copper, brass, cadmium plate and galvanized or zinc coated steel. It is also used to waterproof concrete.

Smaller Transformers

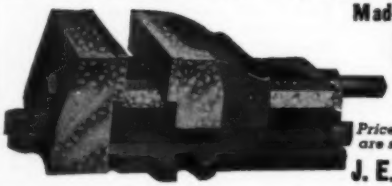
A new line of smaller, lighter transformers is announced by Westinghouse. Available in sizes of from 1½ to 500 kva for voltages of 2400, 4800, and 7200, these new units have cores made of Hipersil, a new magnetic steel which has a flux-carrying capacity about one-third greater than that of ordinary silicon steel. This facilitates reductions in size and weight as much as 25 per cent in some sizes.

Reduced impedance, especially in units smaller than 25 kva, has improved voltage regulation on the average about 10 per cent; and lowered thermal gradients between coils and insulating oil has increased short-time over-load capacity in these transformers.

In single-phase units, maintenance is simplified by a new type of wound core, fabricated into two solid pieces that are strapped together around the coils. If coils need to be replaced, the operation can be performed quickly by removing the strap and lifting one half of the core out of position. Three-phase units have stacked cores similar to those used in conventional transformers.

PLUNKET IMPROVED VISES

Made Right—Work Right—Give Satisfaction



Drill Press Vise

With Extra Lugs for Bolting Down

No. 1—6" jaws, 1½" deep, opens 5" wt. 35 lbs. $26.00
No. 2—10" jaws, 2¼" deep, opens 8½", wt. 90 lbs. $38.00

Prices are net f. o. b. Chicago. Dealers' inquiries are solicited. Write for illustrated folder today.

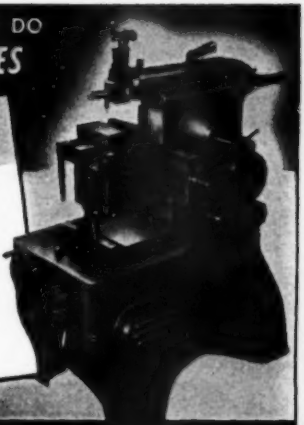
J. E. Plunket Machine Co., 1823 W. LAKE ST., CHICAGO, ILL.

DON'T WAIT FOR A BIG MACHINE TO DO A SMALL JOB... PROMPT DELIVERIES ON VERNON 11" SHAPERS

...handles work as well and faster than larger, costlier machines

Make your shop more efficient by using the right tool for the job. Hand scraped ways, Helical gear and pinion, and variable speed drive with no changing of belts or pulleys indicate the performance that the Vernon 11" SHAPER will deliver.

WRITE FOR NEW LITERATURE NOW!



MACHINERY MANUFACTURING CO.
1915 E. 51 ST., VERNON, LOS ANGELES, CALIF.

The Vernon Line of Horizontal Milling Machines, Combination Vertical Milling Machines and Jig Borers, and 11" Shapers

The REID No. 2-1 Automatic Feed SURFACE GRINDER

DESIGN—Mechanical and Hand Feeds with a reciprocating table and horizontal spindle.

CAPACITY—The No. 2-1 Surface Grinder grinds work 18" long, 6" wide and 11½" high, using a wheel 7" in diameter.

SPINDLE—High-grade heat-treated Chrome Molybdenum Steel; runs in phosphor-bronze boxes. Vertical adjustments are obtained by a hand wheel graduated to .0005".

WORK TABLE—Automatic in both directions and is controlled by dogs operating against a reverse lever.

MOTOR DRIVE—Machine requires a 1½" HP, 1800 RPM Motor. Motor is entirely enclosed in base of machine.

FLOOR SPACE—65" x 30".

Exclusive Selling Agents

H. LEACH MACHINERY CO.
387 Charles St. Providence, R. I.

Send for Circular.
Distributors in all leading Cities.

Reich Surface Test Indicator

The Reich 3-Way Surface Test Indicator illustrated is claimed to be the only indicator available which can be read from either side or the end. This avoids the use of mirrors or getting in awkward positions.

The outfit consists of three parts—the indicator itself, an adjustable mounting arm, and a universal holder. It is ready to use on a milling machine, jig borer, lathe grinder, surface gage, height gage, planer or shaper.

The scale is graduated in thousandths of an inch with non-magnetic move-

ment range of .014". The feeler or contact point is .110" in diameter and may be initially set in any position within 90° from either side of its neutral position.

This handy indicator is offered by the J. R. Reich Mfg. Co., 45 E. Stroop Rd., Dayton, O.

Photogravure by Ryerson

"Ryerson Steel Pictorial" is an interesting periodical issued by Joseph T. Ryerson & Son, Inc., Chicago, Ill. With large page size and printed by the photogravure process, it resembles the gravure section of a metropolitan newspaper.

Large, well-chosen photos are incorporated which show a few of the thousands of uses of steel in daily life. The latest issue includes pointers on cutting the costs of stocking and handling steel.

"Gilbarco" Coolant Pumps

A bulletin describing Gilbarco Centrifugal Pumps for coolants is announced by the Gilbert & Barker Mfg. Co., Springfield, Mass. The pump, ¼ h. p. explosion-resisting motor, and motor switch are built as a compact, integral unit. It is asserted that cutting oil is delivered the moment the pump begins to operate.

for INTERNAL GRINDING MACHINES

Precision

COLLET CHUCK

Where Collets are used.

Collet collapses 1/32". Accurate Grip.
Chuck Shank accommodates various sized collets.

Maintains balance of wheel. Eliminates Whip. No twist on collets—gives greater accuracy and longer life. Chuck shank supplied for any type spindle.

Sizes, ½" dia. to No. 80 Drill.

Patents Pending

COLLET

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ERICKSON STEEL CO.

80th & BESSEMER CLEVELAND, OHIO

Precision Machined BENCH PLATES and ANGLE IRONS

Guaranteed Accuracy ± .0003

WRITE TODAY FOR FULL INFORMATION

Better today than ever. Material—selected grey iron or Milliloy (a Milliken development having two to four times the wearing quality of grey iron).

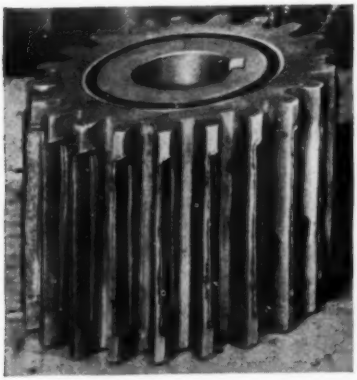
MOST IMPORTANT, recent expansion permits immediate shipment from stock and the ability to provide a better service.

Milliken products have been recognized as a leading industrial value for over thirty years.

MILLIKEN MACHINE COMPANY 23 PROSPECT PLACE WEST NEWTON, MASS.

Bronze Pinion Refuses to Quit

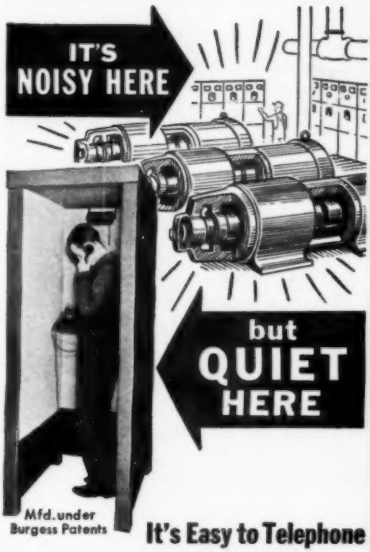
Evidence that teeth of a bronze punch press drive pinion can be worn to less than half their original thickness and still not break, even in medium heavy stamping operations is supported by the illustration.



The bronze pinion, which has a Torflex "insulating" sleeve of rubber and which the user—an automobile manufacturer—insists was giving good service at the time it was removed for inspection, outlasted fibre gears by over six times yet provided a quietness of operation impossible with steel gears, it was stated.

The insulating medium which reduced the transmission of shock and noise was a low cost, "Torflex" bearing consisting of a steel sleeve keyed directly to the drive shaft and separated by the rubber wall from an outer steel tube. The latter makes a press fit with the pinion. Drive was from a 5 h. p. motor at 900 r. p. m. through an 18 to 1 reduction.

Methods of manufacturing these bearings by Harris Products Co. do not require special molds, etc., and thus, special sizes with the proper rubber wall thickness can be made up easily in a short time.



It's Easy to Telephone

This Acousti-Booth Keeps OUT Noise

You'll be surprised at the "zone of quiet" in the Burgess Acousti-Booth. Put your shop phone in one of these acoustically-lined booths. You'll be able to hear clearly without confusion. The patented, sound-absorbing walls blot up factory noise and keep your voice inside. No doors are needed.

There are no mechanical parts—hence no maintenance is required. Open construction makes it easy to use and keep clean. Send coupon for illustrated bulletin and prices.

Mail Coupon for Free Booklet

Burgess Battery Company, Acoustic Division
520 W. Huron St., Chicago

Please send Free booklet describing Burgess Doorless Acousti-Booth and how it makes telephoning easy in noisy places.

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BURGESS ACOUSTI-BOOTH

10,000 Every Hour

Hour after hour, day after day, 10,000 stampings per hour. This is possible when machine is set to run continuously.

The Rousselle is invaluable in today's battle to increase production. For use on light metal, plastics, rubber, or moulded products.

Accurately manufactured, sturdily constructed.

The operator is protected, because it embodies safety features such as Automatic Knockout Bar, and Non-Repeat Clutch, usually found only in larger presses.

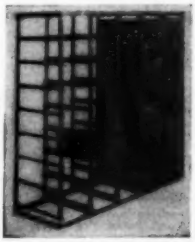
If you're in the market—Write!

DAVID J. ROSS CO.

BENTON HARBOR MICHIGAN

Sterling Racks

Floor space is at a premium these busy days and should be used to the best possible advantage. Sterling Racks



offer an easy way of conserving floor space and saving time by making the contents of all storage boxes immediately available. There's no unpiling to get at the right box.

Sterling Racks are made in units of one or five sections, and are available with or without steel boxes. The racks are of all-welded construction, and are claimed to be rigid, non-tipping and non-swaying.

They are made by Sterling Equipment Co., Providence, R. I.

Hobbing Steel Bulletin

Jessop's "Press E-Z" Hobbing Steel. a dead soft low carbon steel used for making molds for plastics and die castings by the hob sinking method, is described in Bulletin 341 announced by the Jessop Steel Co., 603 Green St., Washington, Pa. "Press E-Z" is an easily hobbed steel said to take a fine finish from the master hob.

For Precision Grinding Formed Milling Cutters used in the manufacture of rifles, pistols, etc.

THE BARNES

Motor Driven Precision Cutter Grinding Machine

General Machinery Corporation

140 Federal St., Boston, Mass.

Telephone Liberty 4826

A CLAMP for Every Purpose

Forged Steel
Quick Acting
Deep Reach
Welders

Sizes Available:
¾" to 10' opening
½" to 16" deep

Write for CATALOG and PRICES on Clamps for all purposes as well as many other tools for use in the Machine Shop.

IN STOCK AT YOUR SUPPLY HOUSE

The Cincinnati Tool Co., 1945 WAVERLY AVE., CINCINNATI, OHIO

"ABRASAW"

BRIDGEPORT No. 47W Wet Cut-Off Machine

More, better and cheaper cuts on practically all materials, are produced by the new Bridgeport "ABRASAW". Cutting speeds are unbelievably fast, material is handled with facility and the polished cuts often eliminate secondary operations.

Capacity 2" in tubing, 1" in solid bars. Our model 48-W handles 3½" tubing, 2½" solid bars.

Let us send bulletin giving full details.

Bridgeport Safety Emery Wheel Co., Inc.
1304 West Broad St., BRIDGEPORT, CONN.

Thin Hex Nuts

For use on shear bolts where a high degree of the stress is lateral, and for general application to light and medium stress fastenings, an improved line of thin hex nuts is announced by Elastic Stop Nut Corp., 2332 Vauxhall Road, Union, New Jersey.

These nuts have approximately 40 percent of the strength of standard-height hex nuts and have been developed to meet the demand in virtually every industry for a self-locking fastening which offers savings in space requirements, weight, and cost. They are said to be approved for use on aircraft by all of the military and civil authorities.

As in the standard-height Elastic Stop Nuts, the self-locking action is accomplished by means of a vulcanized fiber collar which is built into the head of the nut. This tough bone-like material resists the entry of the bolt, thus forcing the nut outward and taking up all thread play. The fiber, being non-metallic and of a resilient character, does not deteriorate under vibration, and so continues to hold the threads of nut and bolt in a constant pressure-contact.

The nuts are available in steel, brass, and aluminum, in a complete range of standard sizes, both coarse and fine thread.

SAVE Labor and Time

Eliminate heavy lifting. Cut handling costs. Table swivels and locks in any position. Can be varied 15½" by slight foot pressure, leaving operator's hands free. Engineered and built by tool engineers, experienced in production of special machines, dies, jigs and fixtures for exacting requirements.

Send TODAY for illustrated catalog No. 2.

MIDWEST TOOL & ENG. CO.
112 Webster St., Dayton, Ohio

Why Not Buy The Original Electric Etcher?

MARK IRON AND STEEL

THE ETCHOGRAPH WAY

New ELKONITE TIP pencil.
New Baby Grand Model at a lower price.

2,000 in use

BREWSTER - SQUIRES CO.
42 Church St., New York, N. Y.

TANNEWITZ DI-SAW

SAVES AN AVERAGE OF $4.80 EACH HOUR IT'S USED

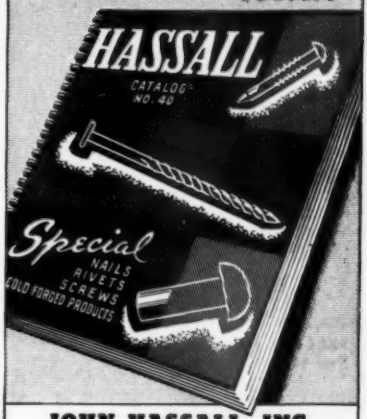
Inside and outside cuts on dies, shoes, templets and endless other jobs can be done in a small fraction of the time required by former methods. Saws, files and polishes. A highly developed, large capacity machine.

Write for literature.

THE TANNEWITZ WORKS

GRAND RAPIDS - MICHIGAN

WRITE FOR NEW CATALOG TODAY.



JOHN HASSALL, INC.

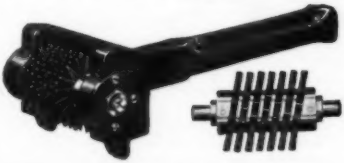
CLAY & OAKLAND STREETS

BROOKLYN, N. Y.

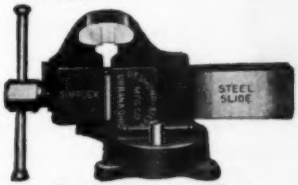
GRINDING WHEEL DRESSERS—VISES

We manufacture the only complete line of Grinding Wheel Dressers and cutters and will gladly suggest the proper one for your wheels.

The exclusive solid steel slide makes Simplex Vises stronger and more serviceable.



Desmond Heavy-Duty Dresser



Simplex Machinists' Vise

Desmond Diamo-Carbo Dresser, best tool room dresser.

Write for catalog H showing complete line of Desmond Dressers and Simplex Vises and name of your nearest dealer.

DESMOND-STEPHAN MFG. CO., URBANA, OHIO

Canadian Desmond-Stephan Mfg. Co., Ltd.—Hamilton, Ont.

2 Lock Tool Chests

GS TOOL CHESTS have separate locks for the open top and for the drawer section. Thus only tools needed are outside while others are locked in drawers. INVESTIGATE. Write today for four page folder.

REASONABLE PRICES.

Geo. Scherr Co.
122 Lafayette St.
New York, N. Y.

T. H. L. FRONT LEVER

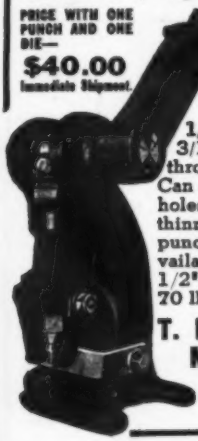
BENCH PUNCH

Built for hard, tough work — die cannot lose alignment with punch — all parts interchangeable.

PRICE WITH ONE PUNCH AND ONE DIE—

$40.00

Immediate Shipment.



Capacity — 1/2" holes through 3/16" steel; 13/32" through 1/4" steel. Can also be made for holes up to 7/8" in thinner metal. Stock punches and dies available from 1/16 to 1/2" by 64ths. Weight, 70 lbs.

T. H. Lewthwaite Machine Co.
(Est. 1890)
311 E. 47th St., NEW YORK

"Ampco-Trode" New Weldrod

The coated aluminum bronze welding rod produced by Ampco Metal, Inc., Milwaukee, has been re-named "Ampco-Trode." This rod is made with the properties of Ampco Metal, which is known as a bronze of exceptional wearing ability and largely used in aircraft, machine tools, heavy machinery, and similar equipment.

Among the features claimed for Ampco-Trode are: its hardness—up to 375 Brinell; great tensile and compressive strength; its ability to be used by all welding methods (metallic arc, carbon arc, and oxy-acetylene); its exclusive composition, being the only coated aluminum bronze welding rod; and its ability to open up new fields of application where common welding rods function with difficulty. It is also characterized by excellent resistance to wear, corrosion, and fatigue.

Ampco-Trode is used for overlaying forming and drawing dies, building up broken gear teeth, refacing wearing surfaces, repairing broken parts, and welding steel, cast iron, Ampco Metal, bronze, and similar metals.

BURR KEYSEATERS

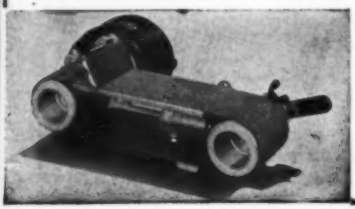
Mill keyways in the run or on the ends of shafting already erected — save money on alteration, erection, and repair work.

Made in 4 sizes, for hand or motor operation.

Write for Bulletins and prices.

JOHN T. BURR & SON
429 Kent Ave., Brooklyn, N. Y.

AN INEXPENSIVE ABRASIVE BAND GRINDER



"Built Like A Machine Tool"

The Hormel-M Grinder is sturdily built with a supporting leg under the grinding table to eliminate vibration and tipping due to pressure on belt. Ball bearing throughout, equipped with Alemite lubrication, complete with grease gun.

Write for illustrated folder on this and other styles and sizes.

WALLS SALES CORP.
96 Warren St., New York, N. Y.

Employment

The Federal Security Agency announces that the number of skilled defense workers registered in State employment offices has increased slightly.

A recent survey, made one week after the opening of a nation - wide effort to induce all available workers to register at their State employment offices, showed an increase of 7,400 or 2.1% more registrants in these selected occupations than a month earlier.

The bulk of the increase was in the building and metal trades. In the aircraft, shipbuilding, and machine shop groups the demand in most cases far exceeded the supply.

The number of unemployed aircraft workers was only 4,300. Almost the entire net increase in registrants during the month was accounted for by two occupations — aircraft riveters and aircraft sheet metal workers. Even in these two occupations, however, the current demand on the State employment offices for workers exceeded the number available.

In the metal trades occupations, the total number of applicants was 168,000. The machine shop occupations, with 29,700 applications, made up the second largest group of metal workers.

In spite of these increases in workers registered in the machine-shop occupations, demand exceeded supply in half of them. The greatest shortages were in the ranks of tool makers and die makers. There were 8 to 12 times as many jobs as available workers.

SPEED—the watchword of Defense Work—is achieved with *"Sandy,* the Surfacer." Slow, tedious hand-sanding is being done by modern, high speed *"Sandy"* which will sand and finish surface jobs on machine tool bases in ONE THIRD the time. That's why *"Sandy"* is used extensively throughout the woodworking and metal industries.

If you have costly hand sand-finishing to do . . . whether or not you're working on Government Contract . . . we suggest that you write to us immediately and have one of our Engineers study your problem to bring you *important savings.* Let *"Sandy,* the Surfacer" go to work in your shop.

"SANDY" at work on plane maintenance. Triples sanding speed on metal, wood and plastics with *quality* finish.

Sterling
TOOL PRODUCTS CO.
363 E. Ohio St., Chicago

SEND COUPON TODAY!

Sterling Tool Products Co.
363 E. Ohio St., Chicago, D-2

Please *rush* me free booklet—
"Hints on Sanding Savings" AT ONCE!

Name_____

Company _____

Address_____

City_____ State_____

"ALNOR" Velometer
An All Purpose Air Velocity Meter
—Instantaneous,
Direct Reading.
Measures total and static pressures as well as velocities.
write for catalog
ILLINOIS Testing Laboratories, Inc.
150 W. Hubbard, Chicago

SHEAR CUT - HIGH SPEED
END MILLS

Shear Cut End Mills are offered in all standard sizes, single and double end. Write today for catalog and prices.
Progressive Tool & Cutter Co.
2345 Wolcott St. Ferndale, Mich.

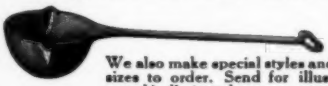
Job Stampings

The recently established H. P. L. Mfg., Co., 2015 E. 65th St., Cleveland, O. will specialize in stampings in small quantities, ranging from 25 to 5,000 pieces. Metal, fibre and other sheet materials will be fabricated.

Under this plan of manufacturing, it is possible to produce stamped blanks through the use of "temporary" tools, thereby eliminating expensive permanent tool costs which ordinarily would be prohibitive in small quantity production. This method of manufacture permits them to offer services as subcontractors for defense products, experimental work, manufacture of devices for markets requiring only limited output and improvements and changes in existing products.

The company was established by Ray Hedberg, Kermit Peterson and Melvin Lorentz who are experienced in the small lot stamping field, having been associated with that industry in Minneapolis for years, prior to establishing the new Cleveland company.

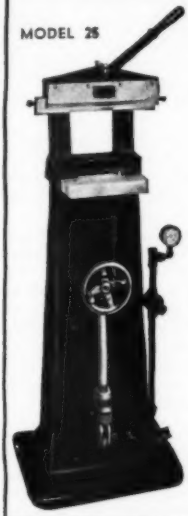
Salem Pressed Steel Ladles
Melting Kettles & Skimmers



We also make special styles and sizes to order. Send for illustrated bulletin today.
THE SALEM TOOL CO.
SALEM, OHIO

for your lathes
SENECA FALLS
Automatic
WORK DRIVER
Self Centering . . . Quick Acting . . . No Slip. Attaches to any chuck plate or spindle. Provides a slip-proof, balanced drive reducing chatter. Handles rough forgings or turned pieces—straight or taper. Eliminates dogging time. Reduces tool breakage. Write for details and size range.
SENECA FALLS MACHINE CO., 314 Falls St., Seneca Falls, N. Y.

MODEL 25



MARK YOUR PARTS

Permanently

PART NUMBERS
HEAT NUMBERS,
CATALOG NUMBERS,
SERIAL NUMBERS,
PATENT NUMBERS
MANUFACTURER—INSTRUCTION DATA—INSPECTION

Positive, Permanent marking on your products assist prospects to order. Makes it easier to buy—new, repeats and repairs. Gives you a definite record of pertinent data on each part produced.

The Pneumatic marking machine illustrated is our HI-DUTY model 25 general purpose tool for short runs or production work. It operates from your shop air line and is one of numerous models built to produce neat, permanent markings quickly on metal fabrications.

We will be happy to make specific recommendations upon receipt of samples or prints of parts to be marked, showing approximate lettering, its location on the part, with required hourly production.

MARKED PARTS ADVERTISE
IN THE RIGHT PLACE, AT THE RIGHT TIME.

Send for complete catalog of our full line of marking Tools, Machinery and Equipment.

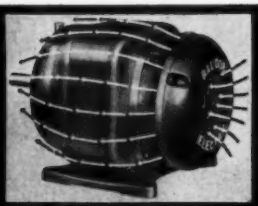
GEO. T. SCHMIDT, Inc.

1802 Belle Plaine Ave., Chicago, Ill.

NEWEST DESIGN

Cool-running

MOTOR



Illustrating forced air-movement over entire exterior of motor frame.

BALDOR Streamcooled Design provides a totally-enclosed, ball-bearing motor with an unfailing, NON-CLOGGING cooling system.
BALDOR Glass-insulated motors withstand higher temperatures SAFELY and provide MORE H.P. in smaller frame sizes.
These and many other features at NO EXTRA COST to you.

BALDOR

Write for Bulletin

BALDOR ELECTRIC CO.
4368 Duncan Ave., ST. LOUIS, MO.

BETTER MOTORS

SMALL COST—BIG VALUE

Small original cost—no upkeep. Big value—uses little room, keeps stock in view. 4 arms, 51" high, stacks 10,000 lbs. 5 arms 57" high 12,000 lbs. flat or round stock. Tubing less weight — capacity 3 stands for 20' lengths; 2 for 12' or shorter. Use back to back in center of room or against wall.

Send for details and prices.

WM. S. YOHE SUPPLY CO.
503 Mahoning Road, N. E.,
Canton, Ohio

Byers Alloy Steels

A. M. Byers Co., wrought iron manufacturers of Pittsburgh will enter the field of alloy steel manufacture about June 15, when the new electric furnace equipment will be placed in initial operation.

Available alloy steel production for America's defense needs will then be increased by another 30,000 to 40,000 tons a year, according to L. F. Rains, president.

Construction of a plant addition and the installation of electric furnace equipment at the Byers' Ambridge works have been speeded because of the shortage of alloy steel in the present emergency, Mr. Rains stated, and added that production will begin six weeks ahead of the original schedule. Initial products will be billets and bars for alloy steel fabricators.

Grinding Coolants

Of special interest to manufacturing executives is an illustrated, five-page feature article on "The Grinding Process and its Dependence on Efficient Cooling" which appears in the March-April issue of Oakite News Service.

Written by Mr. G. Russell Hersam of the Oakite Research Laboratories, the article describes the principal types of grinding and explains some of the "whys" for the high status of this machining process in modern production. Considerable data are also given on the essential part that proper coolants play in assuring desired standards of accuracy, speed and economy. Copies of this interesting, fact-filled article may be had by addressing Oakite Products, Inc., 57 Thames St., New York, N. Y.

GAGES

Let Us Do Your Special Gage Work

We have every facility — adequate precision equipment and expert workers—for the quick and efficient production of all types of Gages, Special Tools, Dies, Jigs and Fixtures, large or small. We have complete heat treating equipment and can handle jig boring jobs on our 18"x36" Pratt & Whitney jig borer. Have been delivering satisfaction since 1929.

Address all inquiries to
Ray W. Rice, Manager.

QUALITY TOOL & DIE CO.
401 N. Noble St., Indianapolis, Ind.

OPEN THE WAY TO GREATER PROFITS

BY USING S&S HINGES

BUTTS AND CONTINUOUS LENGTHS — *for* GUARDS — CABINETS — CASES — BOXES — LUGGAGE

WRITE FOR CIRCULAR

S & S MACHINE WORKS
HARDWARE DIVISION

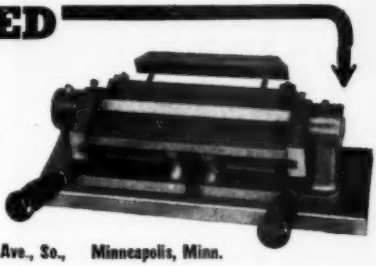
4539 WEST LAKE STREET — CHICAGO, ILLINOIS

NO DIES NEEDED

Die accuracy without dies is what you get with "Micro" Die Duplicating Brake, Shear, Bender. You'll have many small parts finished before dies could be started. The

"Micro" DIE DUPLICATING BRAKE

is a precision die substitute machine accurate to .001". Creates non-stock sized angles, channels, "V"s, etc. Folding width 6"—8"—10"—12".



Write for circular—
"METAL DUPLICATING WITHOUT DIES"

O'NEIL-IRWIN MFG. CO., 314—8th Ave., So., Minneapolis, Minn.

Interesting Dust Control Bulletin

The many uses of Roto-Clone Dust Control in industry are decribed in an attractive bulletin announced by American Air Filter Co., Inc., 527 Central Ave., Louisville, Ky. Scores of photographs vividly depict typical installations of Roto-Clone equipment.

Dust from metal grinding and all other metal-working operations is the subject of several interesting pages. Even the very fine dust from the buffing or polishing of metal can be adequately handled with the aid of Airmat Arresters, it is claimed.

Two basic types of Dynamic Precipitators are offered. Types D and F are designed for the dry collection of granular dust. Capacities range from 200 c.f.m. to 50,000 c.f.m. The Roto-Clone Type W contains integral water sprays, which are said to provide efficient disposal over a wide range of particle sizes regardless of moisture content or abrasive characteristics. Sizes from 1,000 c.f.m. to 36,000 c.f.m.

The Airmat Dust Arrester is designed for the use of Airmat, a "napless" cellulose filtering medium for collecting dust of a linty or flaky nature.

It is pointed out that the makers of this dust control equipment provide an engineering service of wide experience which is helpful in selecting the right units, or designing special systems if required.

NEW!

Abrasive sheets, ribbons and discs with adhesive backing—no glue required. Instantly applied for sanding, lapping, polishing, finishing, etc. Economical and a real time and labor saver.

Write for details.

MUTUAL ENGINEERING COMPANY
326 W. Third St., Davenport, Iowa.

ACROMARK TRADEMARK ***FAST***

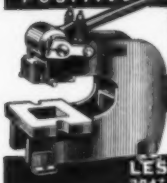
MARKING & NUMBERING MACHINES HELP YOU DO A GOOD MARKING JOB.

Write for latest catalog.

CONSULT OUR MARKING SPECIALISTS ABOUT ANY MARKING PROBLEM.

THE ACROMARK CORPORATION
259 No. Broad St. Elizabeth, N. J.

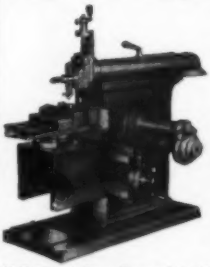
LESLIE HAND PUNCH PRESS
MOST CAPACITY
POSITIVE ALIGNMENT



Max. cap. 2" dia. hole thru 10 ga. iron, proper shear on punch, throat depth 6½. Takes punch press dies up to 3"x4¼" in area. Leaf arm gives perfect alignment without ways or leader pins. Portable. Price $75.00 F. O. B. Chicago. *Ask your dealer, or write for circular.*

LESLIE WELDING CO.
3947 Carroll Ave. Chicago

This Semi-Finished
10" SHAPER
Yours for only $175.00



Complete with VISE

Perfectly designed, shop-tested, trouble-proof construction. Exceptionally efficient. Will stand severest service. Quickly and easily adjusted. Experienced machinists readily recognize this LEWIS SHAPER as being an excellent buy for only $175.00 including all materials, blueprints and LEWIS 7" VISE castings.

Send today for complete specifications and Catalog of Lewis Products.

LEWIS MACHINE TOOL COMPANY
P.O. Box 116, Sta. A, Dept. T-7 Los Angeles, Cal.

Coil Winding Counter

An improved high speed coil winding counter, called the Clipper, is announced by the Production Instrument Co., 704-14 W. Jackson Blvd., Chicago.

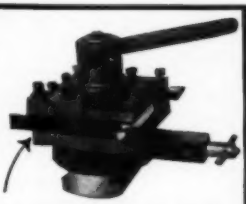
The "Clipper" is designed for direct connection to the motor shaft or for

operation through a flexible shaft. In actual service it is reported as counting at speeds as high as 9000 turns per minute with motor wide open.

Reset to zero is accomplished with a single motion. Unique pointer design gives instant visual check of reset. Deducts turns taken off the coil in case of over-run, permitting accurate winding at high speed.

Large, legible figures read to 10,000 turns. Adjustable base provides for easy alignment with motor.

Colwell Tool Post Turrets
are
Helping On Defense Work
by
Speeding Up Lathe Production On Repeat Operations.



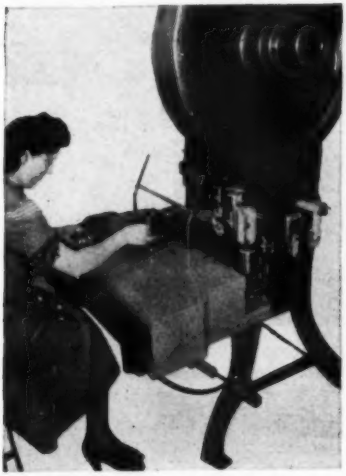
80% of the turrets we have sold since 1938 are now being used on Defense Work. Carries four standard tools including cutting-off tool. Note the simple but effective way in which cutting-off tool is employed.

Will quickly liquidate its cost.

S. G. COLWELL, 25 Congress Ave., Providence, R. I.

Semi-Automatic Feed

A machine is offered by Heyman Co. that will feed blanks to a forming or drawing die, semi-automatically, without danger to the operator. An outstanding feature of the Heyman Semi-Automatic Production Machine is that you can increase your production and provide operator safety without scrapping your present dies. A completely semi-automatic mechanism driven by a separate electric motor operates the press. Speed of the feeding machine sets the pace for the operator.



The indexing table is away from and never goes under the die. The transfer arm places the blank accurately on the die. Two types of arms are furnished—a vacuum and a mechanical pick-up arm. Both are adaptable to a great variety of operations and jobs.

The machine is controlled by a foot switch. The tripping of the press is controlled by the metal feeding machine by means of a cam.

The operation is simple. The operator sits in front of the machine and places the blanks in the nests of the gauge plate (or dial) as it indexes towards her. When the blank comes opposite the die the arm transfers it accurately.

Quick Delivery

FOR UNSKILLED HANDS

You need not use tool makers or you most experienced operators to produce pre cision grinds with a fine finish. GRENB GRINDERS have the required skill bui into each machine. Set-up and productio operations are extremely simple o GRENBY GRINDERS, and you may quickl instruct unskilled hands to produce par with very close tolerances.

The GRENBY MANUFACTURING COM PANY has tripled its production facilitie in the last half year. We are, therefore, pr pared to make reasonably prompt deliveri on GRENBY precision bench grinders.

THE GRENBY line includes Internal, Ex ternal, Flute, Cutter and Surface Grinder

Send for the GRENBY catalog.

GRENBY MFG. CO

Plainville, Connecticu

ALL-IN-ONE

GRINDING AND LAPPING EQUIPMENT FOR COMPLETE MAINTENANCE OF

CARBIDE TIPPED TOOLS, ALLOY AND H. S. S. TOOLS

$122.00 Equipment as shown including diamond lap, 60 grit wheel and 110 V., 60 Cyc., A. C. Motor.

Delivery from stock as above.

OTHER VOLTAGES EXTRA
1750 R. P. M. — 6"x4½" WHEELS
PRE-LOADED BALL BEARINGS.

ACCESSORY EQUIPMENT FOR GRINDING CHIP CONTROL GROOVES. CUTTING CARBIDE TIPS AND SHARPENING TWIST DRILLS.

WRITE FOR BULLETIN 409

T. C. M. MFG. CO.

HARRISON, N. J.

SINCE 1910

Another Expert in the Making

(Photo, Courtesy The Lincoln Electric Co., Cleveland, Ohio)

Working for his "M.D." (Metal Doctor) degree this student welder at California Polytechnic College in San Luis Obispo, Cal., is doing a touch-up job on an aircraft motor mount under supervision of the welding instructor.

By learning to arc weld, students fit themselves for plying an art which is indispensable to modern industry. Without it, not only would industrial production bog down, but high-speed manufacture, fabrication and construction for National Defense would be practically impossible.

Have you our Engineering Data Sheets on the new line of

BABY GUSHER

Machine Tool Coolant Pumps?

Made in four types; 1/30 and 1/10 h. p. for small machine tools and machines requiring from 4 to 10 G. P. M.

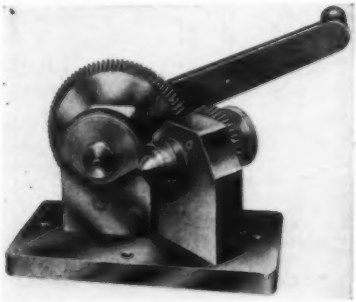
Write for descriptive literature.

The Ruthman Machinery Co.

203 Pike St., Cincinnati, Ohio

Time Train Ring Marker

A newly developed time train ring marking device is a compact bench mounting fixture. It is also suitable for marking fuses, beveled dials, and other pieces which require graduation marking. This unit is custom built for



the marking application. Since the angle of bevel varies greatly with each part that is to be marked, this machine will mark but one size part and one size bevel.

The work holding spindle is designed to provide quickest handling and holding of each part to be marked. It cannot be standardized, because the shape of the part determines the holding means, therefore, production will vary from 100 to 600 markings per hour, depending on part to be marked. By adjusting a bushing the part can be marked to any depth.

Bevel gears at the rear of the device are said to maintain correct peripheral spacing of the mark very accurately. These gears are of wide face to prevent any appreciable wear.

The device is made by Jas. H. Matthews & Co., 3942 Forbes St., Pittsburgh Pa.

"Welding Briefs"

A publication titled "Welding Briefs" is issued periodically by the Metal & Thermit Corp., 120 Broadway, New York. A recent issue discusses the welding of locomotive cylinders by the Pennsylvania R. R., a new 90 ft. freight car with capacity of 260 tons, and other interesting topics.

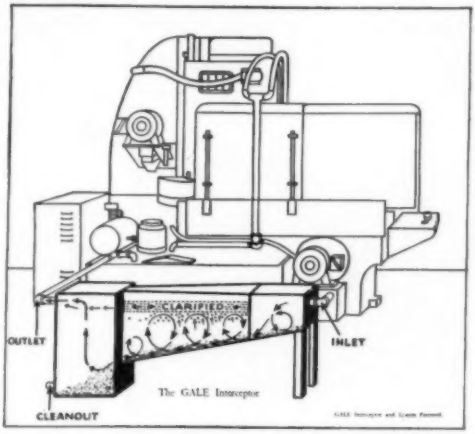
To Keep Cutting Oil Clean

A device for keeping cutting oils and coolants clarified is announced by the Gale Oil Separator Co., Inc., Chrysler Bldg., New York.

The Gale Interceptor and Separator is installed merely by replacing present settling tanks. Operating entirely by gravity, this device is claimed to remove grinding compounds and metal particles.

Oil from the machine is broken apart by a breaker wedge. This slows the lighter liquid and directs it upward to the surface and the heavier metal particles, etc., downward. The harmful material settles into a bucket which can be emptied easily and replaced.

This clarifier is offered in several sizes with or without pump compartment.



The GALE Interceptor

Siebring Steam Cleaner

A steam cleaner is offered by the Siebring Mfg. Co., George, Ia., for industrial and other uses. A specially prepared chemical is furnished in three grades—mild (not to hurt paint), medium (for light grease), and strong (for heavy grease which is claimed to speed cleaning considerably.

The manufacturer also declares that steam can be generated in 15 minutes. Either oil or gas may be used as fuel.

Boiler is all electric welded and reinforced with ¼" steel. Coldwater pressure strength of generator wall is said to be 300 lbs. A patented safety device is provided.

Various attachments available include:—force draft fan, pressure and temperature control, automatic water injector, etc.

Fostoria Announces New Fluorescent Model

Under the heading of "There Is Something New In Fluorescent Lighting," The Fostoria Pressed Steel Co., Fostoria, Ohio, has issued a booklet directed to industry which pictures and describes a new Fluorescent lighting unit designated as "Model MF-240-N."

According to R. N. Green, Director of Engineering, this new lighting unit employs the new National Transformer Power Unit #999, which provides instantaneous starting, without starting switches, and which insures "stabilized" lamp life. The manufacturer claims also that hum, stroboscopic effect, and radio interference are eliminated by the use of this new power unit which is guaranteed for a full year. The new model accommodates two 40 watt Mazda F lamps operating on 60 cycle AC 110V-120V circuits.

Sheldon Announces 11" and 12" Lathes

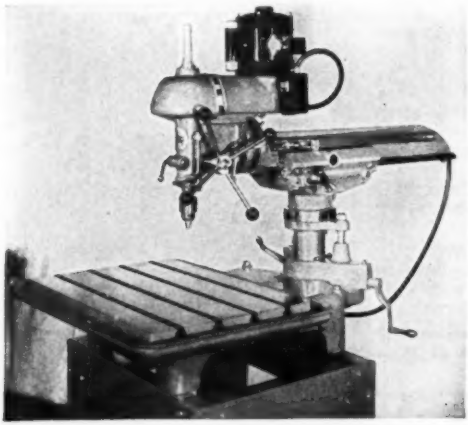
The Sheldon Machine Co., Inc., 1629 N. Kilbourn Ave., Chicago, announces that their new 11" and 12" lathes with pre-loaded ball or precision roller bearing headstocks will have a 1" capacity spindle hole having 1⅜" diameter.

These new lathes will be moderate in price and will come in both bench and floor types with semi-quick or full quick change gear boxes, with plain aprons or worm feed aprons with power cross feed, and with a choice of motor drives including needle bearing overhead motor drive or the Sheldon 4-speed lever - operated "underneath" motor drive, which is entirely enclosed in a cabinet leg. A complete line of attachments and accessories is offered for each of these new lathes.

Thames Gear and Belt Guards

Thames Metal Works, 14 - 16 - 18 Hamilton St. New London, Conn. offer gear and belt guards made of close plate, perforated metal, or expanded metal. This company will design or manufacture to customer's specifications.

It is emphasized that at the present time, safety guards pay bigger dividends than usual because lost time is unusually costly and good workers are hard to obtain.



Here's the handy new Walker-Turner Radial Drill which handles quite a wide range of jobs within its capacity—freeing larger machines for heavier work. It offers many advanced features.

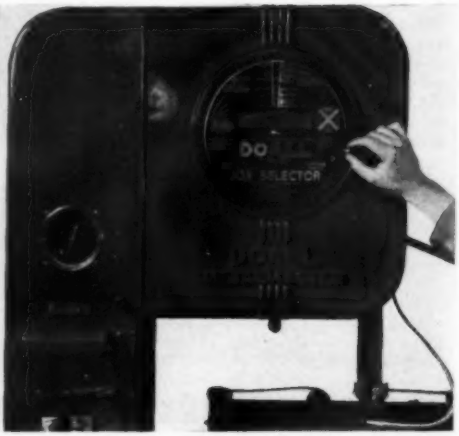
Doall Job Selector

With the increasing demand for speed in production covering thousands of materials, the new Doall Job Selector is a ready reference to all basic materials which are to be contour sawed or filed. Recognizing the great increase in use of alloys, Continental Machines, Inc., 1301 Washington Ave., South, Minneapolis, Minn., has incorporated this feature on all their contour sawing, filing and polishing machines.

The new Selector covers 56 basic materials; ranging from ferrous to non-ferrous materials. A flip of the operator's hand brings to his eye—at a glance—the correct sawing speed, saw temper, saw pitch and saw set, for the speediest and most economical performance. The same information is given when unit is used as a filing machine.

Additional items contained on the Selector cover oiling directions and the minimum width of saw to use in cutting contours of various radii. Of further importance is the elimination of light glare by curving the face of the dial, giving the operator distinct readings at all times.

Cardboard replicas of the new Job Selector are available for Doall users, students and N. Y. A. programs upon request



Pumping unit is located at bottom and back of press.

C-Frame Straightening Press

A new line of heavy duty hydraulic straightening presses is announced by Lake Erie.

Special features stressed include:—C-frame for convenient handling of long bars and fast operation with sensitive control of pressure and stroke.

Bed is fitted with V blocks adjustable to suit work. Spring rollers at ends facilitate movement of bars.

Control is by means of a conveniently located hand lever, operation of which determines desired pressure.

Complete data and specifications on various sizes are available by writing Lake Erie Engineering Corp., Buffalo, N. Y.

Welding Instruction

Lessons in Arc Welding is a series of 60 lessons which present, in concise manner, fundamental facts of welding, knowledge of which will enable the welder to utilize the process successfully and economically.

Beginning with an introduction giving preliminary instruction to the welder, suggestions are offered for making and following a definite plan for learning the fundamental principles of arc welding, and for practicing continually, examining welds, criticizing and inviting criticism of work, for wearing proper protective apparel at all times, and assuming proper working positions, etc.

A valuable feature is the set of questions and answers for each lesson, enabling the student to check his knowledge. This section is contained in 25 pages, with 18 pages of questions and 7 of answers. Since the questions are headed by the lesson number and subject matter, they can be of assistance in furnishing the solution to problems. Knowing the subject matter, the student can refer to the index, find the lesson in which it is covered, then turn to the questions on that particular lesson in the back of the book.

This book makes available to industry and to engineering colleges and universities, also trade and vocational schools, the accumulated welding instruction information from The Lincoln Welding School, which has been in continuous operation for 24 years. It has become, in its early edition, the standard text book of educational institutions throughout the country which now include courses in arc welding as a regular part of the curriculum.

Published by The Lincoln Electric Co., Cleveland, Ohio, the book comprises 176 pages, 6x9"; 170 illustrations, including photos and drawings; cover—semi-flexible simulated leather, gold embossed; price 50 cents per copy, postpaid anywhere in U.S.A., 75 cents elsewhere.

Roll Feeds and Reel Stands

The latest Bulletin (WF-339) of Wittek Mfg. Co., Chicago, contains complete information on automatic roll feeds claimed to provide an improved and simplified method of punch press operation for rapid feeding under all conditions.

Information is also included on reel stands which provide automatically expanding coil holders that center the coil and permit maximum production by eliminating looping, tangling and backlash of stock.

Address Publicity Section, Wittek Mfg. Co., 4305 W. 24th Place, Chicago, Ill.

TAPER PANS

No. 101-18 ga. 10' x 18' x 6'
75c Ea.

No. 102-16 ga. 12' x 20' x 6'
85c Ea.

One - piece, all - welded construction. Hook handle at each end. Any quantity. Immediate shipment from stock. F.O.B. Phila.

American Metal Works, Inc.
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ARBOR Presses
FOOT Presses

Scientifically designed, accurately machined from selected materials. 40 STOCK SIZES and MODELS (bench and floor types).

Write for literature and prices.

FAMCO MACHINE COMPANY
1320 18th STREET
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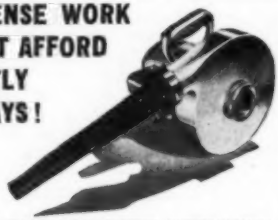
DEFENSE WORK CAN'T AFFORD COSTLY DELAYS!



WRITE FOR DESCRIPTIVE LITERATURE TELLING HOW *DUST AND DIRT*, THE ENEMIES OF PRODUCTION, *CAN BE DEFEATED*...

WITH A CLEMENTS

CADILLAC

PORTABLE ELECTRIC

BLOWER & SUCTION CLEANER

ASK FOR 10 DAYS FREE TRIAL

CLEMENTS MFG. CO.

6651 S. NARRAGANSETT AVE., CHICAGO, ILL.

NEW—

Goggle for Industrial Use

Here is a DIFFERENT type of lightweight goggle that embodies a NEW patented method of indirect ventilation that reduces the danger of fogging. Molded of Durez with rubber cover ball chain bridge and elastic head band.

WRITE TODAY on your letterhead for a pair of these new goggles and a catalog showing our complete line.

SELLSTROM MANUFACTURING CO.

646 N. Aberdeen St. Chicago, Illinois

Lincoln Aircraft Welder

A new arc welding machine, designed particularly for airplane welding, and developed to aid aircraft production for National Defense, is announced by The Lincoln Electric Co., Cleveland, Ohio.

Among the features which adapt it specifically for aircraft work is the system of welding current and voltage control. This permits the finely accurate settings which are essential for welding the particular analyses and gauges of metal employed in modern plane construction.

The current control is Lincoln's patented "dual continuous control", specially designed and engineered for the new unit. This permits independent adjustment of both welding current and voltage to just the right type and intensity of welding arc for the particular application.

Adjustable in a continuous sequence of fine increments, the control avoids compromise settings of conventional welding current controls which the makers point out may sacrifice welding speed or weld quality, or both.

Also important are the current range and capacity. Suited for welding the lighter gauges of aircraft steels — 10 amperes are delivered at the arc without extra attachments—the welder's range also adapts it for heavy materials.

Welder is of motor-generator, single-operator, variable voltage type with laminated pole pieces. Connections are readily accessible for either 220 or 440 volts, (also supplied for 550 volts or special voltages), 3 or 2-phase.

Occupying less than four square feet of floor space, the welder is of arc welded steel drip-proof construction, and is fitted with four steel feet welded to base and drilled for bolting welder in place (for stationary installation), or for attaching 3-wheeled running gear, (for portable service).

It is available in two models, 150 and 200-ampere sizes, either portable or stationary. Current range for the 150-ampere model is 10 to 200 amperes and for the 200-ampere model, 10 to 250 amperes.

Newest addition to special Lincoln equipment for air-craft welding, the new welder joins "Planeweld No. 1" and "Planeweld No. 2", two new electrodes just recently announced by the company for welding SAE-4130 and X-4130, chrome-molybdenum steels frequently used in airplane construction.

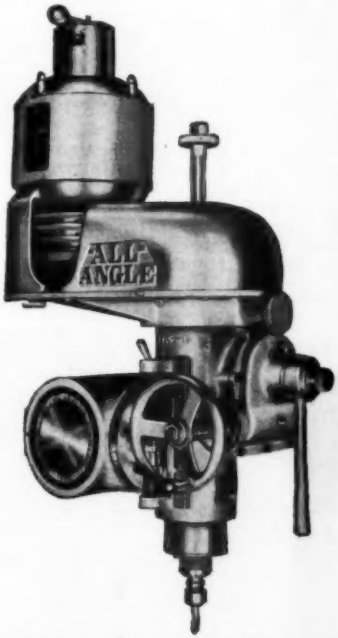
Type D "All-Angle" Attachment

Here are the highlights of new model (type D) "all-angle" full - universal milling attachment now being placed on the market by Fray Machine Tool Co., Glendale, Cal.

Housing is of Meehanite. Two squaring faces are machined on housing for convenience in setting attachment square with table. Castings normalized and bore finished by grinding. Graduations on housing by sixteenths for use with depth stop.

Spindle is of chrome moly steel S.A.E. 4140, 6 splined, hardened and ground all over and drilled for draw-in bolt. Means have been provided so that collets can be tightened by hand or with wrench. Spindles are fitted with four radial thrust ball bearings. Spindle travel is 3½". Spindle is furnished in No. 7 Brown & Sharpe or No. 2 Morse.

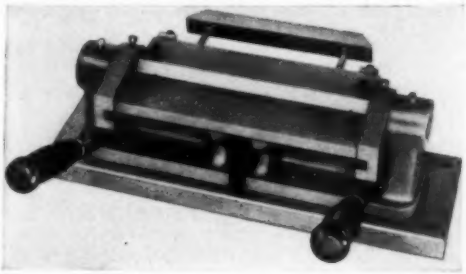
Pulleys are of the 6 step type providing a speed range from 375 to 5200 r.p.m. Motors are of the ball bearing type especially designed and manufactured by Fray. Motor swings completely around housing and can be locked at any point.



Quill is hardened and ground all over and compensated for extreme sensitivity. Means have been provided so that attachment can be instantly changed from micrometer wheel feed to hand lever feed or vice versa.

Micrometer depth stop screw has ground threads. Nuts are large with easily read graduations. Can be positively locked at any point.

A Larger Micro Brake



A new No. 2 Micro Die Duplicating Brake is announced by O'Neil - Irvin Mfg. Co., 314-8th Ave., So., Minneapolis. It is of 8" capacity, designed for working material used in aircraft, communication, electrical, aircraft electronics, and instrument manufacture; for working steel and non-ferreous materials and covering a wider range of work than the original 6" model described recently.

Maximum folding width is 8"; maximum folding capacity full width is 14 gauge steel plate, operated with both handles simultaneously. Maximum folding capacity full width is 18 gauge steel plate, with one handle (either right or left hand) operated. Heavier gauges of other more ductile materials may be handled in proportion. Maximum angular folding, 110 of radii.

Unit is constructed of heavy machine tool grey iron castings and cold rolled steel. Precision adjustable stops are provided for accurately duplicating angles, channels and "vees" to within tolerance of .001" of duplicated work. Full adjustment of variable folding plate in both horizontal and vertical planes is provided with lock screws for permanency of settings. Adjustable material length guides are provided for accurately locating working material.

Pivoted folding plate is of cold rolled steel material and may be drilled. tapped, or slotted for precision material gauge and stops and for forming both right and left hand angles, eliminating conflicting ends of materials in folding. Folding plate may be replaced quickly from regular stock material whenever required. All contact parts are of hardened and heat treated steel.

Grinding threads on a 10" Plug Gage in the fine new plant of Greenfield Tap & Die Corp., which quadruples their gage manufacturing facilities.

Oil Relief Valves

An important item where specific pressure is required of oil hydraulic pumping units is a non-chattering bypass piston type oil relief valve such as that manufactured by The Fulflo Specialties Co., Inc. of Blanchester, Ohio. It is especially useful on machine tool hydraulic mechanisms, oil burning equipment, rams, presses, etc. The makers explain that a cylindrical piston closes off the port in a shearing manner and does not seat abruptly against the body of the valve, thereby overcoming any pounding or chattering noise as may be the case with standard valves using disc seats.

These valves are made in pipe sizes from ¼ to 2" and are suitable for pressures from 0 to 350 pounds with a change of only five different springs for the pressure variation. Bodies are of cast iron or brass and can be supplied with brass, hardened steel or stainless steel pistons.

Where fuel oil is used, a brass valve with stainless steel piston is recommended because fuel contains a certain amount of condensation and foreign matter and a harder, non-corrosive piston is required.

The makers assert that once installed and set for the required pressure, Fulflo valves require no further attention. Complete details and illustration will be furnished on request.

Horizontal Burring Machine

The Pines Engineering Co., St. Charles, Ill., announces the Pines Horizontal Spindle Burring Machine for reaming, burring, facing, threading, or honing tubing and rods.

This horizontal spindle machine features an air-operated work chuck controlled by a limit switch which is tied in with the feed movement lever that advances the spindle. The maker

New LYON
Stationary Hydraulic Elevating Table

FOR taking material off truck or platform and lifting to higher level for easy reloading. Also brings work to convenient height for machine operator. Has many other applications equally convenient. A great time-saver, money saver. Contributes to safety. Easily installed in floor recess. Operation by 2-speed hydraulic hand pump located wherever it's most handy. Models also available with table at floor level. Send us your lifting problem for recommendation, and write for full description and price.

LYON Portable

Hydraulic Elevating Table operated by foot pedal. Useful in die-handling, sheet feeding, material movement.

LYON IRON WORKS
Material Handling Equipment
134 Madison Street, Greene, N. Y.

claims high speed operation with this mechanical-electrical arrangement with production speeds up to 1200 pieces per hour on some classes of work.

Pictured is a typical production setup where three operations are performed in a single pass: tube O. D. is burred, end is faced and I. D. is reamed.

Simplicity of set-up, flexibility and ease of operation are claimed by the maker.

Torq Variable Speed Transmission

The Torq Multi-Stage Variable Speed Transmission is an individual Drive unit, designed especially for the modernization of machine tool equipment. It is built in standard stock units, compact and sturdy in design and is available in two sets of speed ratios. The standard Transmission is a four (4) speed unit with selective speed changing by a conveniently located selector lever. Industry has found it particularly desirable where a compact unit of certain definite speeds is required.

The device is particularly adaptable to production systems — eliminating overhead lineshafts and belts, resulting in improved working conditions, lighting and overall efficiency.

The unit is also available for new equipment manufacturers who require multi-speed units having several predetermined and definite output speeds.

The makers emphasize that it is built to high quality specifications, featuring hardened gears and shafts of special alloy steel, anti-friction bearings, complete oil sealage and splash lubrication. Standard and special mounting brackets are available. It is manufactured by The Torq Electric Mfg. Co., 6605 Carnegie Ave., Cleveland, O.

Stand For "Multi-Purpose" Tool

A stand into which the Senior Model "Multi-Purpose" Tool may be clamped is announced by H & H Research Co., 12544 12th St., Detroit.

This new accessory evidently will broaden the use of this reciprocating - action tool. Clamped into position in the stand, it provides a unique filing machine for most types of work.

"Thin Line" Electric Etcher

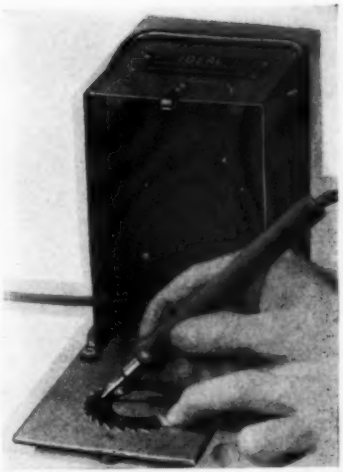
A small, inexpensive Etcher for permanently marking small tools and parts is announced by the Ideal Commutator Dresser Co., 1035 Park Avenue, Sycamore, Ill.

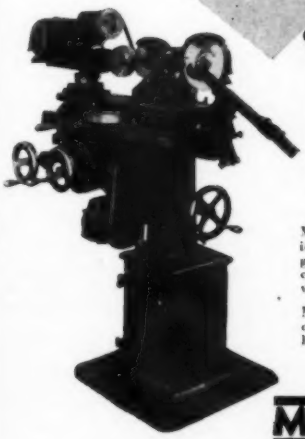
As the name implies, it writes with a fine line, burning the mark, identification number or name right into the metal, so it cannot become blurred or worn off with ordinary usage.

To mark tools, parts in production and finished products made of iron, steel and their alloys they must be placed on work plate (inside of cover). Etcher tool is then held and used as if writing with an ordinary lead pencil.

Complete unit includes 9' primary lead and plug, 2 oz. heat resisting hand piece with 3' lead, 4x6" work plate, operating on 115 volt, 50-60 cycle standard. Other voltages and frequencies available. Etching heat 125 watts. Weight 5¼ lbs. Size only 4¼x4¼x7".

This model is an addition to the Ideal line of Marking Equipment which includes an Electric Marker and three other sizes of modern Etchers. The largest size, a "Heavy Duty" Model, is for etching smooth castings and large metal parts.





STERLING

Universal Tool & Cutter Grinder

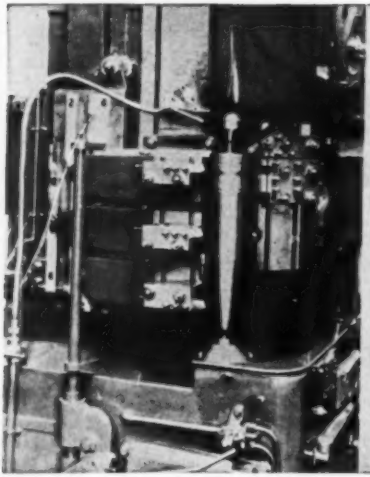
Model "C" is completely equipped to perform grinding operations such as cylindrical, surface, internal, angular and face work. One size—10" swing, 18" between centers, 20" longitudinal table travel, 8" cross feed, 8" vertical movement.

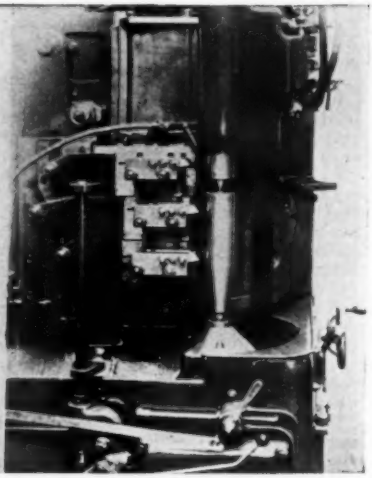
Main parts are of ample weight to insure vibrationless operation. Made of scientifically processed cast metal, heat treated. Ways and sliding surfaces hand scraped.

Write for bulletin giving all data.

McDONOUGH MFG. CO.

EAU CLAIRE, WISCONSIN, U. S. A.





STACKING BOXES

An excellent all-purpose shop box. Sturdy all-welded construction. Heavy skids act as a positive stacking lock and re-inforce box at point of maximum wear. Made in any size or gauge of metal. Immediate shipment from stock on standard sizes.

No.		Each
601	10"x16"x6"—18 ga.	$ .95
602	12"x18"x8"—16 ga.	1.25

F.O.B. Philadelphia—Any Quantity

American Metal Works, Inc.
1518 Germantown Ave. Philadelphia, Pa.

Machining Anti-Aircraft Shells In England

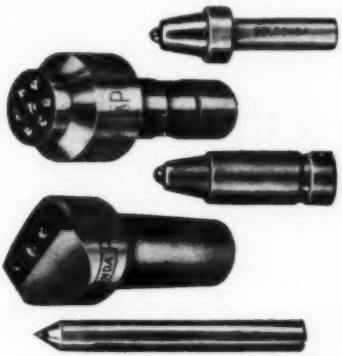
Use of "formers" and tungsten carbide cutting tools is reported to be speeding production of anti-aircraft shells in Great Britain. At the left is shown a close-up of a No. 12 Rydermatic Shell Lathe (British) being used for finish turning 4.5" shells, including the driving band groove. Note the triple "former" slide control employed to regulate movement of the carbide tools used for turning the shell (at left). Carbide tools at right are for facing and boring.

At the right is shown a close-up of a similar lathe tooled for machining 3.7" anti-aircraft shells. Again, the triple former slide is in evidence, operating the turning tools.

The tools themselves are of "Wimet" tungsten carbide, produced by A. C. Wickman, Ltd., Coventry. Tungsten-carbide powder for the manufacture of these tools is supplied extensively to Britain by the Carboloy Co., Inc. General Electric tool subsidiary in Detroit.

Golconda Diamond Tools

Several interesting types of diamond tools are offered by the Golconda Diamond Products Corp., 2214 W. Armitage Ave., Chicago. "Polypoint" tools have 3 or 7 solid diamonds symmetrically arranged in a special alloy setting. They are set at a low temperature under controlled atmosphere, which is claimed to eliminate oxidation and preserve the original hard skin surfaces of the diamonds.



The three-diamond type are adapted to cylindrical and surface grinding wheels; the seven-stone tools are well-suited for centerless grinders. It is pointed out that with these multiple-point tools, re-setting is not necessary; the matrix wears away as the diamonds are used

"Singlepoint" tools have forged or alloy settings which are said to grip the stone securely. "Golcone" Tools are cone shaped to 60°, 90°, or 120°. They are mounted in special forged settings.

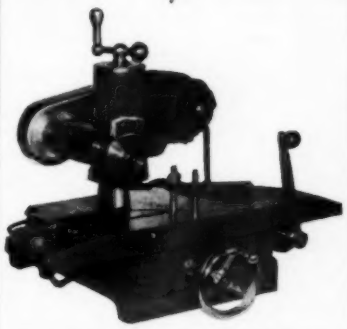
Knu-Vise Clamp Catalog

A convenient, loose-leaf catalog of their toggle action clamping fixtures is announced by Knu-Vise, Inc., 16841 Hamilton Ave., Detroit, Mich.

The many products described include:—Knu-Vise toggle and "Kam-Klamps," toggle pliers, Knu-Vise and "Klampacto" "C" clamps, and hand squeeze riveters. Line drawings of these devices are also included.

NEW Gibson

Carbide Lip Grinder



Designed to meet the demand for a machine to generate and grind lips, or chip curlers in carbide tools, and to provide means for obtaining positive duplication in such work.

These are some of the advantages of the Gibson machine: Low diamond wheel cost; Compactness; Rigidity; Versatility Smoothness of operation; Easy adjustment; Wide range of usefulness and simplicity of application.

All wearing surfaces receive an abundance of oil. The diamond wheel receives lubrication through felt wicks.

For more details on this time and money saving machine, write to

Kokomo Machine Co.

KOKOMO, INDIANA

Flexible Abrasive Wheels

An interesting new line of flexible abrasive wheels has been developed by Field Abrasive Specialty Co., 203 Lowe Bldg., Dayton, Ohio.

Designed for precision work where flexibility is required, these wheels are useful accessories for sanding and finishing regular and irregular jobs, penetrating into difficult recesses, lapping holes in dies, finishing various shapes of metal, wood, rubber and plastic parts.

The wheels have five continuous layers of abrasive cloth. The cloth is perforated ¼" from end and glued and the working part is flexible. Made in three grits (coarse, medium and fine) the wheels are available in a number of different sizes, along with suitable mandrels. Descriptive bulletin and sample wheel will be sent on request.

Radius Cutting Tools

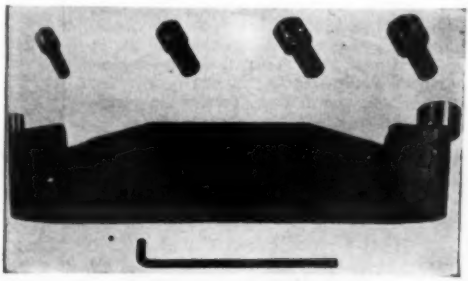
The Forest City Bit & Tool Co., Rockford, offers an inexpensive Radius Cutting Tool, with a newly designed tool holder for the smaller size cutters.

The new holder No. 0, will take 3/16, ¼, 5/16, ⅜, 7/16, and ½" diameter cutters, cutting radii of 3/32, ⅛, 5/32, 3/16, 7/32 and ¼". Special size cutters can be made on application.

The cutters are held in position by a hollow hex screw against a flat seat on the shank of the cutter.

Cutters are made of high speed steel, designed so that the radius remains the same regardless of the number of times sharpened. The ground face surface of cutters is parallel with bottom of tool holder.

The cut illustrates the position of the cutters held in the holder at the correct angle. The holder is made from a special alloy steel and designed for application in a Lathe or Shaper. Size of holder, 1"x5"x1½". The complete set of 6 cutters and holder with wrench is fitted into a solid wood block.



Suprex Enters Gage Field

Announcement of Suprex Gage Co., is made by N. A. Woodworth, President. Its plant at 420 Ten Mile Road, Pleasant Ridge, Mich. (suburb of Detroit) has new machinery throughout and up-to-the-minute temperature control equipment.

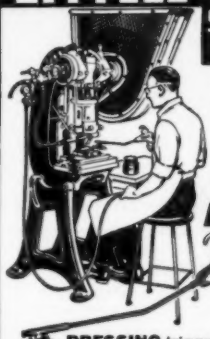
600 ROOMS with BATH and RADIO

FROM $3.00

- Ideal Location
- Unlimited Parking
- Radio in Every Room
- Refurnished & Redecorated

HOTEL
PHILADELPHIAN
DANIEL CRAWFORD, JR., Manager
39th & Chestnut Streets • Philadelphia

LITTELL *Pres-Vac* SAFETY FEEDER



KEEPS HANDS OUT OF DANGER ZONE

PRESSING trigger creates strong vacuum in cup for holding flat-surface materials for feeding to press. Releasing trigger releases piece held. Keeps hands out of danger zone. Single and double-cup types.

ASK FOR BULLETIN 9-C.

F. J. LITTELL MACHINE CO.
4155 RAVENSWOOD AVE. CHICAGO ILL.

A VERY POPULAR MACHINE FOR THE MACHINE SHOP
⅓ H. P. CAPACITY
TYPE M5A

Strand
FLEXIBLE SHAFTS

GOOD TIMES
OR
BAD TIMES
IT PAYS TO BUY
GOOD TOOLS

FLEXIBLE SHAFT MACHINES
AND
ATTACHMENTS
COVERING HUNDREDS OF OPERATIONS

WE BUILD
HORIZONTAL AND VERTICAL TYPES
FROM ⅛ TO 3 H. P.
HIGH QUALITY MACHINES
AND
FLEXIBLE SHAFTS
Since 1905

¼ H. P.
TYPE M Y 4

N. A. STRAND & CO.
5001 N. Wolcott Ave. Chicago

THE WONDER CUTTER

Cuts wire or rod up to ⅝ inch round (⅞ inch square) and band iron up to ⅛ by 2 inches.

Adjustable stop for repeated cuts to same length. Hardened cutters last indefinitely.

Powerful leverage makes all cuts easy. Small size permits placing wherever convenient.

Small in size but a giant for work. The lowest priced rod and band cutter on the market. Every shop needs one. Hundreds in use.

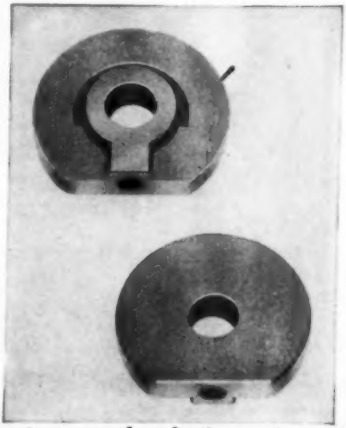
You can get one for free trial in your own shop.

Write today for further details and price!

THE FEDERAL FOUNDRY SUPPLY CO., **4602 EAST 71st STREET, CLEVELAND, OHIO**

Selflube Porous Bronze Bearings

Keystone Carbon Co., 1935 State St., Saint Marys, Pa., has recently developed several new shapes and sizes in their line of Selflube porous bronze bearings. The illustration shows top and bottom views of one of these new designs.



These bearings are made from powdered alloys, which are moulded to size in the shape desired, then baked, and finally quenched in a good grade of oil. They have an average porosity of 35%, enabling them to store a large amount of oil which is claimed to form a protective, continuous oil film on the bearing surface. In many instances, this oil reserve is said to last the entire life of the application, eliminating the use of oil vents or grease cups. Additional lubrication is recommended for heavy duty or continuous operating units.

The bearings have a high tensile strength of over 35,000 lbs. per sq. in. They have a low friction coefficient which, together with their self-lubricating qualities, prevents excessive temperature, speed reduction, noise, and scoring of shafts. They are moulded to close dimensional tolerances so that no re-designing or special engineering is required.

USE ECONOMY — DERIVE ECONOMY

SOCKET HEAD CAP SCREWS

MILLED FROM BAR

HOLLOW SET SCREWS

MADE OF ALLOY STEEL

ECONOMY MACHINE PROD. CO., 5207 Lawrence Ave., Chicago, Ill.

MACHINE TOOL BLUE BOOK

Mechanics Through the Ages

FRENCH NEEDLES WERE MADE BY MASS-PRODUCTION METHODS IN 1760-! HEATED HUNGARIAN STEEL WAS HAMMERED, DRAWN TO SIZE, SHEARED INTO NEEDLE-LENGTHS; A MAN THEN FLATTENED AN END, ANOTHER PIERCED THE "EYE", A THIRD CLEANSED THE OPENING, A FOURTH FILED SMOOTH THE EYE AND FASHIONED ROUGHLY BOTH BODY AND POINT. TEMPERING AND ROASTING WAS FOLLOWED BY HAMMERING. ABOUT 15,000 NEEDLES SPRINKLED WITH EMERY AND OIL WERE WRAPPED IN BUCKRAM AND ROLLED FOR SEVERAL DAYS. THEN THE NEEDLES WERE WASHED, DRIED IN BRAN, CULLED, POINTED, WIPED AND PACKAGED—!

AS EARLY AS THE MIDDLE AGES IRON MONGERS OF CATALONIA SPAIN HAD FIGURED OUT THAT THEY COULD INCREASE THE BLAST OF THEIR FORGES BY RUNNING STREAMS OF SWIFT MOUNTAIN WATER DOWN PIPES BACK OF THE FURNACE THUS CAUSING SUCTION-

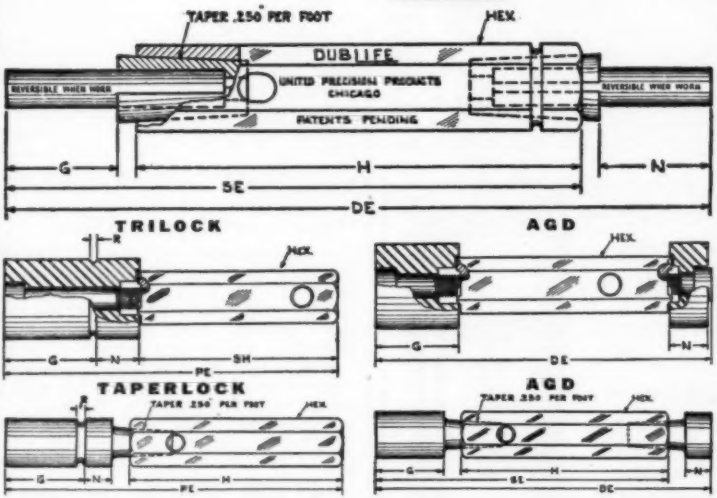
THREE OF THE EARLIEST LOCOMOTIVE DESIGNERS AND BUILDERS FOR THE B & O RAILROAD WERE WATCHMAKERS BY TRADE!

Lockheed Stimulates Ambition

The Lockheed Corporation at Buffalo is reported to have boasted that out of 25,000 employees, every man in the plant has had promotions in the last year. These promotions are recorded through a card check - up system. Every man who makes an excellent showing on one operation is considered the better prepared for the next job that pays a slightly higher rate. If a man is excellent at a drill press it's taken for granted that he might be excellent on a grinding machine, or other tool, and next as a straw boss. One man explained his position in the line by saying:—"I am used on the third shift as my training ground. As soon as I reach production standards, I'll be turned to second and first shifts."

The incentive has induced 9,000 men at the plant to attend school during the last year to fit themselves for better jobs, or for a higher degree of efficiency on their present jobs.

The New **DUBLIFE** *Gauges*



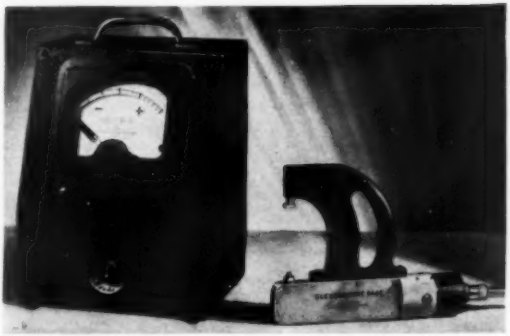
United Precision Products, exclusive manufacturers of Plug Gauges, announce a new improved DUBLIFE Gauge. The handle is made of hexagon material with bronze tapered collet which locks around the plug as it is driven into the handle. The plugs are reversible, so that when one end is worn the other end can be used, thus giving double life. We carry in stock, gauges from .030" to 1.5".

A new catalog showing DUBLIFE and AGD Gauges will be sent to those requesting it on company letterhead.

UNITED PRECISION PRODUCTS CO.

4618 W. HURON ST., CHICAGO, ILLINOIS

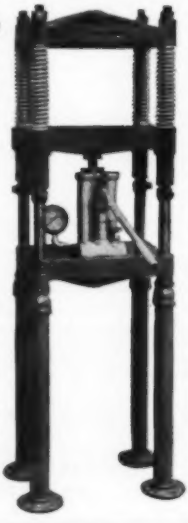
P. & W. Electrolimit Snap Gage



Many of the advantages of a comparator are claimed for the new Pratt & Whitney Electrolimit Snap Gage. This new device brings measurement to ten - thousandths of an inch to the work in the machine. Here is a new adaptation of the P. & W. Electrolimit principle as a snap gage that can be used in all sorts of ways where fine inspection is needed. The gage is light and easy to handle, and its electric circuit magnifies any errors into an easily read needle movement on a dial. The result is a considerable saving of time with no loss in precision.

There are two gage bodies available, and several sizes of frames for each body. By using the right combination, the Electrolimit Snap Gage can be arranged for dimensions from ½" up to 6". The two smallest frames have ¼" adjustment, and all the others ½" adjustment. Or if there are several diameters to be checked, and conditions are favorable, a portable instrument cabinet can be furnished with selector switch and connections for several gage heads.

Floor Type
PACIFIC HYDRAULIC
Hand Operated Press
•
20-25-30 ton
Let us make recommendations for operations adaptable to this type of press.
•
Pacific Hydraulic Press & Tool Co.
P. O. Box 87
Huntington Park, California.



"Distic" for Abrasive Discs

A new adhesive for "instant" mounting of abrasives on steel discs is announced. Known as "Distic," it is said to save much time and convenience over the old way, using glue or cement, clamping, then weighting.

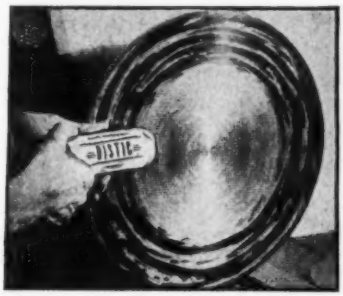
With Distic it is necessary merely to apply a generous amount while disc is in motion, place garnet or emery paper over surface of disc and press on with

"ALIVE" Ball Bearing Centers

"They turn with the work"
Write TODAY — and let us tell you more about them.
MODERN MACHINE CORP.
323 Berry St., Brooklyn, N. Y.

fingers. Disc is now ready to work.

It is claimed that this new adhesive saves time wasted waiting for old type adhesive to dry, a new application can be made over the old, and the inconvenience of having several steel discs is overcome.



Full details may be obtained from The Distic Mfg. Co., Box 763, Albany, N. Y., or from The Delta Mfg. Co., 600-634 E. Vienna Ave., Milwaukee, Wis.

Truck and Caster Catalog

An attractive new catalog is offered by the Hamilton Caster & Mfg. Co., Hamilton, Ohio, describing their extensive line of trucks and casters for shop and factory use.

The Hamilton line includes casters, wheels with steel, hard rubber, or pneumatic tires, as well as wheels with hard maple treads. Platform trucks, two wheel hand trucks, and a general line of warehouse and factory trucks are offered. A few of the many special trucks made by this company are also depicted.

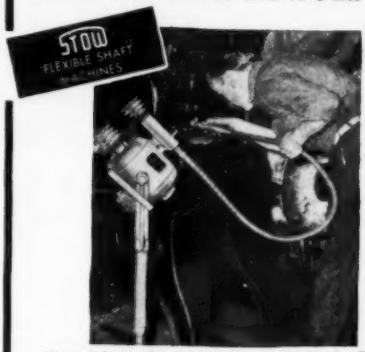
"Steel Stamina" Booklet

A breezy booklet titled "Steel Stamina" contains many cartoon drawings on the army camp life of "Sam Stamina," and a humorous map of the United States and the oceans using a "defense" theme. Reference is also made to heat treating activities at the Lindberg Steel Treating Co., 218-230 N. Laflin St., Chicago, Ill., who issue the booklet.

Avoid

PRODUCTION HOLD-UPS...

Take This Tool to the Work!



Repairing die in press, a typical Stow time-saving application

LET Stow Flexible Shaft Machines help you utilize every working minute . . . avoid machine lay-ups . . . keep the work moving. You take these rugged, heavy-duty machines right to the work — for repair jobs or steady production. Make time-saving applications for grinding, polishing, sanding, filing, etc.

With 66 years' experience, Stow offers you an extensive choice of units and attachments that provide the right machine for either heavy-duty or intermittent work. Get full data on Stow . . . it's a profit-making investment that keeps production flowing!

FREE—get your copy of Stow's new complete catalog; contains valuable new technical data on the right machine for different uses and operations.

STOW MANUFACTURING CO., Inc.
30 SHEAR STREET
BINGHAMTON, N. Y.

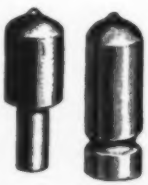
Glimpse into a Welding Section of the busy Hobart Trade School. In addition to welding, the training will be expanded eventually to include complete machine shop practice and other mechanical trades. (Photo Courtesy Hobart Brothers, Troy, Ohio.)

Better Lubrication

A folder just published by the Sun Oil Company stresses the importance, particularly at this time, of the added man-hours and machine-hours that are obtainable through the use of more efficient petroleum products. It points out how the output of present production equipment can often be substantially increased by modern petroleum products and engineering services that are immediately available to all industry.

This folder states that a higher "P-Q" or Production Quota, is obtainable only when men, machines and petroleum products are all functioning efficiently. It puts emphasis on the necessity for utmost care in selecting cutting oils, lubricants or processing oils for each specific job, bearing or operation. It calls attention to case histories, facts and figures showing how Production Quota increases have been secured by changing from one petroleum product to another. And it invites consultation with technical field representatives for specific recommendations on any lubricating problem.

For a copy of this folder write Sun Oil Co., Philadelphia, Pa., and ask for "P-Q —Your Key to Increased Production."



FOR DEFENSE

KARELSEN'S DIAMONDS KEEP THE WHEELS OF INDUSTRY TRUE

DIAMOND POINTED EMERY WHEEL DRESSERS

¼ KT. TO 10 KT.

IMMEDIATE SHIPMENT

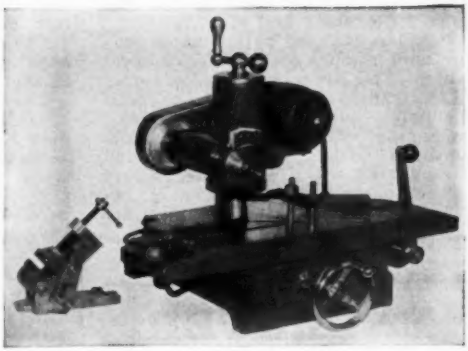
Send for Prices *Specify Holder*

"If its made of Diamond—Ask us First."

E. KARELSEN, INC. *Established 1852* 56 W. 45th St., New York, N. Y. Tel. VAN. 6-5688

Gibson Carbide Lip Grinder

This new unit has been designed to generate and grind lips, or chip curlers in carbide tools, and to provide means for obtaining positive duplication in such work.

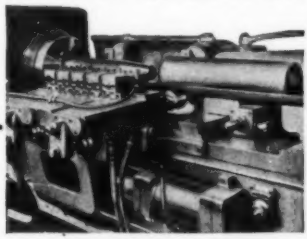


The machine consists, fundamentally, of a movable work table and a spindle for a diamond wheel. Spindle is carried in a housing, mounted on a vertical column. Vertical column can be swiveled through 360 degrees, and is graduated through the 90 degrees of useful movement. The spindle housing is precision fitted to column, and elevating screw is completely enclosed. Column rests on a dovetailed cross slide, kept in proper adjustment automatically. Thus, position of wheel, in relation to table, can be quickly and universally varied.

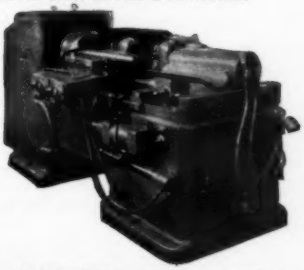
Transverse movement of table is accomplished by hand lever. The lever applies motion through a gear and rack, and is quickly adjustable, without tools, to any desired position. The table moves on accurately spotted vee and flat slides, and construction af-

MOREY "27" Semi-Automatic Lathe for Rough Turning 155 MM Shells

Minimum cutting time—maximum feed and speed that the work and tools will permit. Loading time from conveyor to belt about 5 seconds.



Close-up of MOREY "27" Semi-Automatic Lathe, tooled for rough turning, cutting off and facing 155 MM Shells. Machine shown with rough forging, ready to slide on the arbor.



MOREY "27" Semi-Automatic Lathe tooled for rough turning, cutting off, and facing 155 MM Shells. Machine shown with hydraulic arbor and tailstock in loading position

Write for detailed information.

MOREY MACHINERY COMPANY, INC.
410 BROOME ST., NEW YORK, N. Y.

fords protection against abrasion. The table rests, without anchorage, on slides, and can be lifted off at any time, for cleaning and oiling.

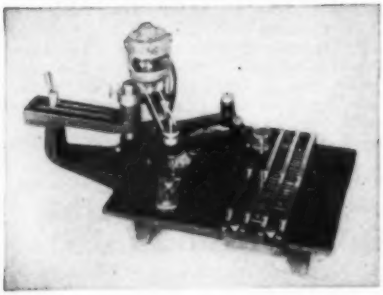
Power is supplied by a Dumore motor with stamina for the 3" diamond wheel. The power is transmitted over a flat canvas belt, through balanced aluminum pulleys. A hinged motor base provides automatic belt tension. Diamond wheel receives lubrication through felt wicks which are positive in action, long lived and easily replaceable. All wearing surfaces are properly lubricated

Unit is shipped complete with motor, drop cord, switch and tool holding fixture, but without diamond wheel. Angle vise, suitable for grinding lips in back and side rake tools, is furnished at slight extra cost.

Any desired radius of lip groove can be obtained by swinging the narrow diamond wheel a predetermined number of degrees out of line of table travel. The biased cutting action of wheel prevents formation of minute parallel lines running at right angles to line of chip travel, which, frequently impair the life and performance of carbide cutting tools.

Manufactured by Kokomo Machine Co., Kokomo, Ind.

—MICO— ENGRAVER



For lettering panels of steel, aluminum, brass, or bakelite, or for marking finished apparatus

A sturdy machine for routine production as well as occasional engraving.

Attachments increase its versatility to include large work on flat or curved surfaces.

Excellent engraving can be produced by an inexperienced operator.

Prompt delivery. Catalogue on request.

Priced from $115 with Type

Mico Instrument Co.
14 ARROW STREET
CAMBRIDGE, MASS.

"Dublife" Plug Gages

A new and improved "Dublife" Plug Gage has been developed by United Precision Products Co., 4618 W. Huron St., Chicago, exclusive manufacturers of Plug Gages.

Handle of the new Gage is of hexagon material, with bronze tapered collet which locks around the plug as it is inserted into the handle. The plugs are reversible so that when one end is worn the other end may be used, thus giving double life. Stock sizes of Gages are carried in a range from .030 to 1.5".

An attractive new catalog has just been published, giving descriptions, specifications and considerable useful engineering information on the subject of Gages. Copies will be sent to those requesting same on Company letterheads.

Socket Screw Catalog

The Holo-Krome Screw Corp., Hartford, Conn., announces an 8½" x 11" catalog of Socket Screw Standards containing data not included in previous editions.

Standards (approved by the American Standards Association and sponsored by the S. A. E. and the A. S. M. E.) for Socket Set Screws, Socket Head Cap Screws, Socket Screw Keys and the formulas for determining all dimensions are included — also screw data and thread and body length tolerances.

Electrolimit Universal Internal Comparator

Pratt & Whitney announce an Electrolimit Universal Comparator as a companion instrument for their Standard Measuring Machine. It is designed to meet the big demand for an instrument to measure internal dimensions over a wide range of sizes.

Reported as quick and accurate, it will reveal out-of-round, taper and bellmouth conditions. It is said to be particularly well suited for checking ring gages and similar parts. By taking ordinary precautions in such essential details as cleanliness, temperature and operating technique, it is claimed that this comparator may be read within an accuracy of .00002".

It covers a range of sizes from ½" to 10" diameters inclusive, and occupies a floor space only 18" x 20" plus a 13⅛" circle for the indicator stand. It operates from any 110-115 volt, 60 cycle, a.c. source having reasonably constant voltage and frequency regulation.

Eye Protection

"Protection for the Eyes and Face" is the subject of a 4-page bulletin just released by The Boyer-Campbell Company, 6540 Antoine St., Detroit.

Blade Breakage Stopped Production Insured

BY INSTALLING

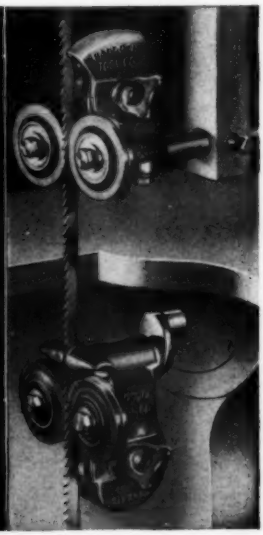
PADDOCK Ball Bearing BAND SAW GUIDES

Recommended for New and Old Machines cutting all material at any speed.

SENT ON 10 DAYS' TRIAL

The use of Paddock Ball Bearing Guides increases the efficiency of the machines so that more and better work can be done. The hazard of operation is reduced. Most of the blade breakage is eliminated. Wheels are interchanged—in effect, three sets of guides in one.

Write for details today and list of prominent manufacturers using Paddock Guides.



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- ☐Band Saw Guides
- ☐Band Saw Machs.
- ☐Bar Cutters
- ☐Bars, boring
- ☐Bearings Ball
- ☐Bearings, miniature
- ☐Bearings, oilless
- ☐Bearings, roller
- ☐Bearings, thrust
- ☐Belt Fasteners, metal, leather
- ☐Belt Lacing
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- ☐Bench Plates
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- ☐Blueprint Machy.
- ☐Bolt & Nut Machy.
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- ☐Boring Heads
- ☐Boring & Turn.Mills
- ☐Boring Tools
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- ☐Chain Drives
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- ☐Cylinders, hydraul.

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- ☐Diamond Tools
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- ☐Gear Testing Mch.
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- ☐Grinders, abrasive belt

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- ☐Grinders, cutter & tool
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- ☐Gun Making Mchs.

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- ☐Lathes, spinning
- ☐Lathes, toolroom
- ☐Lathes, turret
- ☐Layout fluid
- ☐Lighting Equipment
- ☐Lubricating systs.
- ☐Machine Tool Drives
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- ☐Molybdenum
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- ☐Oil groovers
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- ☐Punch Press Guards
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- ☐Punches & shears
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- ☐Saws, hole
- ☐Saws, metal cut.
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- ☐Screw Machine Tools
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- ☐Tap Extractors
- ☐Tap Holders
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- ☐Taps
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- ☐Thread Roll. Mch.
- ☐Threading Mchs.
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- ☐Toggle Pliers
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- ☐Tool Holders
- ☐Tool Salvage
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- ☐Tools, cutting
- ☐Tools, cutting-off
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- ☐Turrets, tool post
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- ☐Valves, foot, solenoid, pilot
- ☐Valves, hydraulic
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- ☐Vises, pipe
- ☐Vises, planer & sh.
- ☐Vises, universal
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- ☐Welders, arc
- ☐Welders, engine driven
- ☐Welders, seam
- ☐Welders, spot
- ☐Welders, tube
- ☐Welding Accessories
- ☐Welding controls
- ☐Welding rods
- ☐Wire Forming Machines
- ☐Wire Straightening Machines
- ☐Wire-Working Machinery
- ☐Wrenches
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Classified Section

USED AND REBUILT MACHINERY

Lists of Used and Rebuilt Machinery, either For Sale, Wanted, or For Exchange, set in uniform style, will be published in the Classified Section at the rate of $5.00 for your name and address and a five line advertisement. For additional lines, 40c per line.

Write directly to those offering the machine for sale, **for prices and full descriptions. If what you seek is not advertised, write Hitchcock Publishing Company, Chicago, making known your wants on either new or used machinery and the publisher will gladly pass them along to the advertisers.**

FOR SALE BY
Aaron Machinery Co.,
176 Lafayette St., New York, N. Y.

Borer, Rockford 3" horizontal.
Die sinker, Jackson No. 10, s.p.d.
Drills, radial, 3' Morris, 3½', 4' Muelier, m.d.
Eyeletting machines, United Shoe, Model B.
Gear hobbers, G. & E. and Shuchardt & Schutte, b.c.
Grinders Brown & Sharpe No. 1, 2, 13 universal.
Grinders, Bryant No. 6 internal.
Grinders, No. 55, 60, 65, Heald internal.
Lathe, 14"x6' Lodge & Shipley, grd. hd., 12 speed.
Lathe, Hendey 24x8', 9 speed, geared head.
Lathe, 24"x14' Prentice, geared head.
Lathe, Pond 39x21'.
Lathe, 18-36"x7'-10' Fay Scott, sliding bed gap.
21" Gisholt, 3½" hollow spindle.
Bardons & Oliver No. 2, 4.
Steinle 24", Universal, 6½", h.s., m.d.
Pratt & Whitney 20x26" grd. head, s.p.d.
Miller, Cincinnati No. 4 plain.
Miller, Cleveland No. 1 plain, s.p.d.
Millers, B. & S., Cincinnati No. 2, 3.
Millers, Brown & Sharpe No. 12 production.
Miller, Cincinnati No. 3 Universal.
National-Acmes No. 53, 55, 56, m.d.
Gridley, Model F, 4 spindle, ¾".
Gridley, single spindle, 3½".
Shaper, Ohio 16", s.p.d.
26" Libby, 7½" hole.

Art Welding Co.
1600 N. 9th St., St. Louis, Mo.

Lathe, Lodge and Davis 24"x10' cone drive, loose change gear, hollow spindle, taper attachment, full swing 4-jaw chuck, $500.00.

Siegman Machinery Co., Inc.
561 W. Washington Blvd., Chicago, Ill.

Bevel gear tester, Gleason 15", arr. for m.d.
Grinder, Greenfield hydraulic, No. 1—8"x18".
Grinder, tool & cutter, Cincinnati No. 1.
Grinder, tool & cutter, Wilmarth & Morman, No. 1.
Grinder, Bryant No. 10A.
Lathes, Lodge & Shipley, 16x8, q c.g.
Lathe, 26"x12' Schumacher-Boye, quick change.
Mill, Hendey Norton No. 2 univ.
Profiler, single spindle, No. 4 Garvin.
Thread cutter, Coulter auto. 6" g. h. 4"x24" s.p.d.
Please send us your inquiries.

FOR SALE BY
Lloyd Machinery Inc.
150 Broadway New York, N. Y.

Boring mill, 42" Gisholt, 2 heads, m.d., rap. power tr.
Gear generator, 11" Gleason, auto. bevel, s.p.d.
Grinder, 84" Diamond, wheel diam. 30", m.d.
Lathe, turret 18" Libby Model A, s. p. d.
Planer, 60"x60"x10' Cincinnati, dbl. std., 3 hds., m.d.
Slotter, 24" Newton, table diam. 42", m.d.

Globe Machinery Co.
602 W. Lake St., - - - Chicago, Ill.

PRICED RIGHT FOR QUICK SALE.

Boring bar, 3", Beaman & Smith horiz., floor type, gear box, motor drive.
Boring mill, 35½" Rogers vert., all grd. fds., 1 head on cross rail.
Broach, LaPointe-Hudson, No. 3, m. d., cut keyways to 1⅜", bro. sq. holes to 3½" across flats, 54" stroke.
Planer, 26"x26"x6' Hamilton, 1 head on cross rail, pulley drive.
Planer, 36"x36"x16', 6" bed, Gray, 2 hds. on rail, pul. drive.

Nelson Machinery Co., Green Bay, Wis.

Brake, Keene 10' Cornice, No. 114.
Compressor, LeRoy Model 2S, size 315 CFM, direct m.d., 75 h.p., 3-60-220/440-860 RPM.
Drill, 28" Barnes, sliding hd., H.W.L.&G. p.f., bd.
Lathe, 14"x6' LeBlond, l. c., 39" centers, s. b. g.
Lathe, 14"x8' L. & S., q. c., 56" centers, s. b. g.
Lathe, 16"x10', Rockwell, l. c., 78" centers, d. b. g.
Lathe, 22"x10' Schumacher, Boye, l. c., 72" cent., s.b.g.
Planer, American 30x30x10', belted.
Planer, Ohio 28x28x8', belted.
Punch, Reade, 36" throat, plain, m.d.
Shear, Lennox circular beveling, belted.

Jenkins Interlock Manufacturing Co.
443 N. Thirteenth St., Philadelphia, Pa.

Lathe, 12"x5' Davis, q.c., m. d.
Miller, hand.
Press, arbor, 25 ton.
Press, punch, 18 ton.
Turret lathes, 2½"x24", G. H., J. & L. (2)

Lang Machinery Company — 28th St. & A. V. R. R. — Pittsburgh, Pa.

Air compressor, 8"x8" Chicago NSB, 116 c.f., m.d.
Air compressor, 9"x10" Ingersoll-Rand "ER-1", b. d.
Air compressors, Ingersoll-Rand XB-2, 600, 885, 1200 & 1500 cu. ft. 100 lb. pressure, motor drive.
Air comp. 14"x12" Ing. Rand "ER-1", 464 c. f., m. d.
Bolt cutter, 1" Landis, 1½"-8"sq., hd., b. d.
Bolt cutters, 1" Acme, Landis hds., 2 & 3 spdl.
Boring mill, 36" Bullard rapid prod., s. p. d.
Boring mill, 42" Bullard, 2 swivel heads, b. d.
Boring mill, 72" Colburn, 2 heads, r. p. t., m. d.
Boring mill, 8' Betts, 2 hds., grd. feeds, b.d.
Boring mill, horiz. 2½" bar N-B-P, knee type, b. d.
Boring mill, horiz. 3½" bar D & H, floor type.
Boring mill, horiz. 5" bar Barrett, b.d.
Boring mill, horiz. 5½" bar Niles, floor type.
Brake, 8'x12 gauge D & K leaf type, s.p.d.
Bulldozers, No. 2 & No. 4 Wms. & White, m.d.
Die sinker, No. 3 Pratt & Whitney, b. d.
Drill, mult. No. 3 Rockford 3 spdl., s.p.d.
Drill, mult. 10 spindle D-12 Fox, b. d.
Drill pointer, Sellers, m. d.
Drill, radial, 3½" Prentice, t. a., b. d.
Drill, radial, 3' & 4' Bickford, t. a., m. d.
Drill, radial, 4' Fosdick, t. a., b. d.
Drills, upright, 11" to 34", b. d. & m. d.
Gear cutter, spur, 30"x16", B. & E., m. d,
Gear cutter, spur, 84" Newark, m. d.
Gear planer, 54" Gleason, bevel, m. d.
Generator, 100 KW Westinghouse d. c., 125 v. b. d.
Generator, 150 KW Jeffrey, d. c. 250 v. b. d.
Grinder, disc, 18" Diamond, dbl. end.
Grinder, dbl. end, Standard Elec. 7½ H. P. 220 v. d. c.
Grinder, gear tooth, Detroit No. D-12, m. d.
Grinder, internal cylinder, No. 5 Landis, b. d.
Grinder, internal 6"x6" Ott, cap. ¾", b. d.
Grinder, piston, No. 2 Van Norman, b. d.
Grinder, tool & cutter, Ingersoll inserted tooth, m.d.
Grinder, univ., No. 5 B. & S., 20"x72", b. d.
Grinder, No. 60 Heald, b. d.
Hammer, 30-lb. Bradley, upright strap.
Hammer, power, 300-lb. Bradley, upright helve.
Hammer, power, No. 4 Beaudry, b. d.
Hammer, 1500 lb. Bliss, board drop, b.d.
Hammers, steam drop, 600-lb. to 9000-lbs.
Hammers, steam forging, 800 lbs.—6000 lbs.
Keyseaters, Mitts & Merrill No. 6—36", m. d.
Keyseater, No. 3½ Baker, 36", m. d.
Lathe, 10"x5' Seneca Falls, p. c. g. b. d.
Lathe, 12"x6' Seneca Falls, q.c.g., b.d.
Lathe, 14"x6' Rockford, semi-q. c. g., d. b. g., b. d.
Lathe, 15"x8' Sidney, q.c.g., d. b. g., b.d.
Lathe, 15"x10' Sebastian, p. c. g., s. b. g., b. d.
Lathe, 15"—24"x8' Sebastian grd. head, m. d.
Lathe, 16"x8' Pratt-Whitney, p. c. g., b. d.
Lathe, 16"x10' Bradford, grd. head, q. c. g., m. d.
Lathe, 16"x24"x8' So. Bend, gap, b.d.
Lathe, 17"x6' LeBlond, automobile, b. d.
Lathe, 17"x8' LeBlond, q.c.g., d.b.g., b. d.
Lathe, 18"x6' American, q. c. g., d. b. g., t. a., b. d.
Lathe, 18"x6' Prentice, p. c. g., t. a., b. d.
Lathe, 18"x6' Carroll, d. b. g., q. c. g., b. d.
Lathe, 18"x6' Prentice turning, d. b. g., p. c. g., b. d.
Lathe, 19"x10' Hendey, q. c. g., b. d.
Lathe, 18"x8' Rockford, semi-q. c. g., d. b. g., b. d.
Lathe, 20"x8' American gd. hd., q.c.g., m. d.
Lathe, 20"x10' Hamilton g. d. head, q. c. g., s. p. d.
Lathes, 26"x11' Wickes hvy. duty comb. Eng. & Tur.
Lathe, 27"x11' LeBlond, grd. hd., q.c.g., d.b.g., m.d.
Lathe, 27"x12' Putnam, hvy. duty, q. c. g., d.b.g., b. d.
Lathe, 27"x18' Sidney, d.b.g., q.c.g., b.d.
Lathe, 32"x14' S. & B. hvy. duty, d.b.g., q.c.g., b. d.
Lathe, 32"x16' Schumacher & Boye, p.c.g., d.b.g., b.d.
Lathe, 36"x10' American, p. c. g., t. a., b. d.
Lathe, 36"x36' 6" New Haven, p. c. g., b. d.
Lathe, 36"x45' N-B-P turning, grd. head, m. d.
Lathe, 40"x16' Fifield, trip. grd., int. face plate d., b.d.
Lathe, 42"x20' Springfield trip. grd., p. c. g. b. d.
Lathe, 46"x17' 7" Pond, triple grd., p.c.g., b.d.
Lathe, 48"x 22½" Johnson, trip. gd. int. face pl. dr. b.d.
Lathe, 48"x36½" Johnson, trip. gd. int. face pl. dr. b.d.
Lathe, 60"x20' Niles, b. g., b. d.
Lathe, gun boring, 2 bar, cap. hole 12"x40', m. d.
Lathe, turret, 16" Warner-Swasey, h.s. 1 7/16", b.d.
Lathe, turret, 18" Reed, h.s., 1¼", p. f., b. d.
Lathe, turret, 24"x24" Jones & Lamson, h.s. 2½", s.p.d.
Lathe, turret 26" Libby, h.s. 8", s.p.d.
Leveller, 84" Bertsch 7 rolls, m. d.
Leveller, plate, 48" McKay, 17-roll, m. d.
Miller, duplex, 36"x33"x10' Ingersoll, m. d.
Miller, hand, No. 3 Rockford, table, 18"x44".
Miller, plain No. 1 B & S. tbl. 37"x 11½", b.d.
Miller, plain, No. 24 Brainard, b. d.
Miller, plain, No. 2-A Milw., tbl. 48"x13", s. p. d.
Miller, plain, No. 5-C Becker-B., tbl. 60"x16", b. d.
Miller, slab, 30"x24"x12' Ingersoll, adj. rail, m.d.
Miller, univ. No. 3 B & S, tbl. 34"x19", s. p. d.
Miller, Vert. Taylor & Fenn, tbl. 20½"x6", m. d.
Miller, vertical Niles, table 42" dia. b. d.
Pipe machines, Landis 1" to 2", belt drive, (2).
Pipe machines, 8" Williams, 2½" to 8" motor drive.
Planer, 24"x18"x4' New Haven, 1 head, b. d.
Planer, 24"x24"x8' Lodge-Davis, 1 head, b. d.
Planer, 30"x30"x6' Gray, 1 head, b.d.
Planer, 30"x30"x8' Cincinnati., 2 heads, m.d.
Planer, 36"x36"x10' American, 2 heads, m. d.
Planer, 36"x36"x11' Sellers, 2 heads, rev. m.d.
Planer, 36"x36"x14' Gray, 4 heads, b. d.
Planer, 48"x48"x30' Putnam, 3 heads, m. d.
Planer, 54"x54"x20' Pond, m. d.
Planer, 56"x56"x10' Gray, 4 heads, b.d.
Press, double acting, No. 1 Bliss, roller feed,
Press, dbl. crank, 79-D, Stoll 72"x26", m. d.
Press, hydraulic 150 ton Chambersburg, m. d.
Press, hydraulic, 100 ton, Watson-Stillman, m. d.
Press, forging, 1500 ton Farrell-Birmingham, m.d.
Press, o. b. i. No. 3 Adriance, stroke 2½",
Press, o. b. i. No. 68-C Bliss, stroke 5"
Press, perforating, No. 5 V & O, str. 4", dbl. crk., b.d.
Press, straightening, Hunt hydraulic, 50 tons.
Press, wheel, 300 ton Chambersburg, m.d.
Profiler, No. E3, Keller, motor drive.
Punch, lever, No. 58 Niagara, 36" throat.
Punch & shear, comb. No. 10½ Badger, ½" thru ¾".
Punch & shear, No. 3 L & A, rap, act. ¾"-¾".
Punch & shear, Cleveland EF, 1¼" thru 1", m.d.
Punch & shear, Cleveland "G", 2" thru 1", m. d.
Punch & shear, dbl. end. No. 00 Covington, 2"-1", m.d.
Saw, band Type JM Laidlaw, cap. 6", m. d.
Saw, band 26" Crescent, tilting tbl. 26"x24", b. d.
Saws, hack, 4"x4", 6"x6", 9"x9", 12"x12", b. d. & m. d.
Saws, 20-B Racine, cap. 6"x6", m. d.
Screw machine, Pratt & Whitney, cap. 1", b. d.
Shaper, 14" Hendey friction, b. d.
Shaper, 16" Steptoe, b. g., b. d.
Shaper, 16" Cincinnati, b.d.
Shaper, 18" Gould & Eberhardt, b.d.
Shaper, 20" Cincinnati, d. b. g., b. d.
Shaper, 21" Smith and Mills, high duty, b.d.
Shaper, 24" American, high duty, b.d.
Shaper, 28" Steptoe, b. g., b. d.
Shear, allig. Pittsburgh, cap. 2"-2½", m. d.
Shear, allig. No. 7 United, 6" square, m. d.
Shear, alligator, No. 61 Carlin, 3" round high knife.
Shear, bar, Mesta 36"x1¼", m. d.
Shear, circle, No. 05 Niagara, b. d
Shear, flying, Edwards, capacity 10 sq. in.
Shear, plate, 119"x¾" Wheeling, gap, 18", m.d.
Shear, plate, 10'x¾" Pittsburgh, gap, 15½", m. d.
Shear, plate, 125"x3/16" Hyde Park, gap 15", m.d.
Shears, plate 156"x3/16 Hyde Park, gap 17", m. d. (2)
Shear, plate 156"x3/16" Standard, gap 15", m.d.
Shear, plate 8'x1" United, m.d.
Shear, rot. No. 10-M Marshalltown throatless, 10 ga.
Slotters, 8" Belts, table 20" dia., m. d. (2).

(Continued on next page)

USED AND REBUILT MACHINERY

FOR SALE BY

Lang Machinery Company — **28th St. & A. V. R. R.** — **Pittsburgh, Pa.**

(from preceding page)

Slotter, 18" Bement, table 36" b. d.
Slotter, die Garvin, str. 34", tbl. 12" dia., m.d.
Straight'ner, strip, & cut. No. 1 Schuster, 2½"x¼", m.d.
Straight'ner, shape, No. 3 Sutton, 2-way, cap. 2½", m.d.
Tapping machine, No. 2 Garvin, ¼"-¾", b. d.
Tapping machine, duplex Garvin 2-X, ½"-¾", b.d.
Vertical attachments Nos. 3 & 5 Cincinnati millers.
Welders, 150 amps, 200 and 300 amps, portable.

Reynolds Machinery
171 Pine Street, Providence, R. I.
Phone: Gaspee 5187

Chucking machine, No. 6A Potter & Johnston auto.
Gear cutter, No. 4 48" Brown & Sharpe, autom.
Lathe, 24"x14" Maine, double back gears, q.c.g., etc.
Milling machine, No. 5 Becker vertical.
Milling machine, No. 3 Kempsmith plain, rebuilt.
Planer, 30x10 Whitcomb, m. d., rebuilt.
Planer, 24x8 Whitcomb, one head.
Turret lathes, 2x24 Jones & Lamson, (3).
Turret lathe, 3x36 Jones & Lamson double head.

Oliver Motorcraft Corp.
2532-34 So. Wabash Ave., Chicago, Ill.

MICRO INTERNAL CYLINDER GRINDER
Belt driven, overhead countershaft, long spindle, grinds wet or dry, universal fixture for clamping work. In very good condition.
Priced reasonable at $800.00

B. D. Brooks Co., Inc.
119 Broad St. Boston, Mass.

Sheet metal working machinery, hand and power.
All types of new and reconditioned equipment.
Apron brakes, press brakes, shears, folders.
Bending rolls, corrugating rolls, forming rolls.
Punches, beaders, rotary machines, stakes, etc.

Alex Zeeve
2282 Woolworth Bldg., New York, N. Y.

Boring mills, vertical, 51" Bullard, 2 heads, m.d., 34" Rogers, spd.
Cylinder boring mill, horiz., 7" bar, for cylinders up to 96" diameter.
Drill, radial, 3' American, gear box drive.
Gear hobbers, 24" Rhenania; 18" Schuchardt-Schutte.
Hammers, power., 500 (2), 400 and 75 lb. Beaudry "Champion".
Hammer, steam, 250 lb. Niles-Bement-Pond, agle. fr.
Keyseaters, No. 3 & No. 2 Mitts-Merrill, No. 2 & No. 1 Baker.
Lathes, 39"x20' Rahn-Mayer-Carpenter semi-q. c.; 30"x13' H. S. & G., q. c.; 29"x16' Walcott, q. c. g., taper,; 24"x16' Whitcomb-Blaisdell, q. c. g.; taper, 24"x11' Lehmann, 16 speed gd. hd., md., taper,; 21"x12' LeBlond, 12 speed gd. hd., m.d., taper,; 20"x10' Lodge & Shipley, q.c.g., dbg. bowl head, 16"x6' Kimball-Walcott, 12 spd. gd. hd., spd., others.
Millers, No. 3A Milwaukee, plain, dble overarm, rapid traverse, spd.; No. 6 Whitney hand, m.d.
Planers, 36"x36"x14' Woodward-Powell, 1 rail head, 1 side head; 24"x24"x8', Cincinnati.
Roll, pyramid, 10'x9" Hilles & Jones, drop-end, m.d.
Saws No. 8 Marvel metal-cutting band, m. d.; 6"x6" Avey "Millband", arr. m. d.
Shaper, 30" Stepton, heavy duty, b.g., cone.
Shear, 8'x3/4" Lennox, rotary splitting, m.d.

ALSO MANY OTHER TOOLS.

D. H. Prutton Machinery & Tool Co.
5295 W. 130th Street, Cleveland, Ohio

Air compressor, 80 cu. ft., Allis Chalmers, m. d.
Bolt pointers (two), Economy 1"
Boring mill, Bullard 24", 1 turret head on rail, 1 square side head, No. 6028, rapid production.
Box printer, single color, Hall & Brown.
Broach, No. 2 Lapointe, 2 spindle.
Chucks, 35-6"x9" Heald magnetic.
Chuck, 1-12"x48" Heald magnetic.
Drill, No. 2 Avey matic 2 spindle.
Drill, 4 spindle Demco, b. b., p. f. single pulley drive.
Grinder, disc, No. 50 Gardner, m. d.
Grinder, disc, No. 50 Gardner, semi auto., with fixture for grinding edges of electric iron bottoms.
Grinder, disc, No. 14 Gardner.
Grinder, disc, No. 120 Gardner.
Grinder, disc, 22" Gardner, m. d.
Millers, (two), No. 12 B. & S.
Pipe threader, 4" Bignell Keeler.
Pipe threader, 2" Oster.
Planer, 36x36x10 Woodward & Powell 1 head on rail.
Plate, polisher, No. 27L Excelsior, m. d.
Press, No. 1 Bliss cam drawing, s. s.
Press, No. P2 Ferracute.
Press No. 65 Consolidated, s. s., flywheel type.
No. 0-36 Unishear, m. d., less motor
Manville four slide, hand feed, cap. ¾x1.
Tappers, vertical (two), 5 spindle Webster & Perks.
Tapper, No. 2 Garvin.
Tappers (two), 5/8" Rickert Schafer.
Thread roller, 3/8 Waterbury.
Threader, 2 spindle, 1" cap., National Acme.

E. L. Klauber Machinery Co.
3221 Olive St. - - St. Louis, Mo.

Gear hobber, No. 000 Schuchardt & Schutte.
Grinder, 5"x18" Ott plain cylindrical, b. d.
Lathe, 14"x7' Hamilton, taper attchmt., and collets.
Lathe, 14"x8' Fay & Scott, gap bed, draw-bar, m.d.
Milling machine, Type OY Brown & Sharpe, plain.
Press, No. 69N Bliss o.b.i., double action, roll feed.
Radial, 2¾' Carlton, high speed, belted.
Shapers, 16"-20' Ohio, 20" Cincinnati.
Slotter, die, Universal, 10" rotary table, 2" stroke.
Testing machine, Rockwell, No. 5 H-40.
Threading machines, Landis, 2" single head.
Turret lathes, No. 3 Dreses, g.f.h., 1¾" bar feed.

Standard Machinery Co.,
347 Indiana Ave. Grand Rapids, Mich.

Cylinder grinder, Heald No. 65.
Drill, 25" Superior, sliding head.
Drill, 40" New Haven, sliding head.
Extractor, DeLaval 26 quart.
Gear cutters, Whiton No. 14 automatic, (2).
Lathe, 24"x8' Lodge & Shipley, q.c.g.
Lathe, 2"x24" Jones & Lamson, flat turret.
Miller, No. 1 U. S. Hand, m. d.
Tapper, Anderson No. 40 Dial Feed Auto.
Welder, Expert Portable, 50 KVA.
Welder, Thompson Spot 25 KW, foot operated.

FOR SALE BY

Manning, Maxwell & Moore, Inc.
5 Watson Street, Boston, Mass.

Turret lathe, Acme flat, 2¼x34, with very complete equipment for both chucking and bar work, serial number 3413. Price $1,750., FOB our plant.

The Elyria Belting & Machinery Co.
Elyria - - - - - Ohio

Bulldozer, No. 8 Williams & White.
Compressor, 7x6 Ingersoll-Rand, ER 1.
Cut-off machine, Bardons-Oliver, geared.
Drill, 34" Upright, sliding head, b g.
Grinder, No. 1 Cincinnati tool & cutter.
Miller, No. 2 B.&S. plain.
Miller, No. 2 Pratt & Whitney, plain.

Fuchs Machinery & Supply Co.
1102-4 Farnam St., Omaha, Nebraska

Broach, No. 1 LaPoint, h.d.
Drill, 3 spdl. Henry Wright, 15" overhang, prod. table.
Drill, 3' American rad., s.p.d.
Drill, Barnes 4 spdl., 20" with individual belted m.d., each spindle, 220-3-60.
Grinder, Micro internal cylinder, m.d.
Grinder, pedestal, 7½ h.p., U.S.B.B.
Hammers, 50 & 100 lb. Little Giant.
Lathe, 20x10 American, d.b.g., q.c.
Lathe, 16x8 South Bend, l.c.
Lathe, 30x10 Monarch, geared head, m.d.
Nibbler, No. 1 Campbell 3/16, pedestal, b.d.
Press, No. 84 DAG Ferracute, d.a. cam.
Punch & shear, No. 3 A Royersford dbl. end shears 8x¾. Punches 1" through ¾.
Roll, 5'4" diam., belt drive.
Saw, 6x6 Peerless, b.d.
Saw, 9x9 Peerless hack, m.d.
Shaper, 16" Rockford, cone drive.
Shear, No. 2 Ryerson serpentine, m.d.
Shear, 8" Kling rotary splitting.
Slotter, 16" Putnam, 27" table.

Jones Machine Tool Company
Front & Pike Sts., Cincinnati, Ohio

LATHES

16"x8' Lodge Ship., q.c.
18"x8' Mueller, q. c.
18"x10' Monarch, q. c.
20"x10' Hamilton, q. c.
26"x12' Bridge'd, q. c.
30"x14' American, q. c.
28"x14' Boye & E., c. d.
36"x16' Pittsburgh, c. d.
32"x14' Amer., c. d.
No. 6 W. & S. turret.
Acme 14" turret lathe.
14" Pratt & W. turret.

MILLERS & SHAPERS

No. 3 LeBlond Uni. c.d.
No. 3½ Fox plain, c. d.
26" Kelley shaper, c. d.
24" G. & E. hi. duty c. d.
24" Cin'ti sgl. pul. drive.
20" Steptoe, cone drive.
20" Smith & Mills c. d.
18" American cone drive.
16" Smith & Mills, c. d.
24"x8' Gray planer, 1 hd.

MISCELLANEOUS

No. 4½ Bliss, press, s. s., double crank.
No SRGI02 Ferracutes. s. double crank.
No. 76 Toledo b. g.
No. 62 Tol. o.b. non-inc.
No. 6 Bauroth o. b. inc.
No. 20C Bliss, O.B.Inc.
No. 2 R. & K. O. B. Inc.
No. C-3 Ferr. O. B. Inc.
No. 5-A Willard o. b. inc.
6' Fosdick radial, s. p. d.
2" Acme bolt cutters.
No. 1½ Cincinnati tool & cutter grinder.
No. 2 Davis keyseater.
No. 4 M. & M. keyseater.
28"—36" B. & S. gr. cut.
Style "P" Baker hvy. dr.
6 —3/16" cap. Bertsch shr.
18" gap

ONLY A FEW—LET US KNOW YOUR WANTS

FOR SALE BY

Davis Machinery Company
1-3-5 St. Clair St. Toledo, Ohio

Drill, 6' American triple purpose radial.
Gear cutter, 48"x12" Gould & Eberhardt, s.p.d.
Gear cutter, No. 3-36 Brown & Sharpe, s.p.d.
Gear generator, 5 AC Lees Bradner.
Grinder, No. 14 Brown & Sharpe, b.d.
Grinder, No. 2 Diamond surface, b. d.
Hammer, 50 lb. "Little Giant" trip.
Keyseaters, No. 0 and No. 2 Baker.
Keyseater, No. 2 Mitts & Merrill.
Lathe, 32"x26' Gleason, st. c. gear.
Lathe, 14"x8' Monarch, q.c.g., cone dr.
Lathe, 19"x8' LeBlond, hy. duty, q.c.g., c.p.
Mill, A B Becker vertical, s. p. d.
Mill, No. 3 LeBlond plain, c.p.
Mill, No. 3 Hendey Norton plain.
Mill, No. 1 Knight miller and driller.
Shaper, 16" Cincinnati, crank, b. g. for m. d.
Turret lathe, No. 5 B. & O., power feed.

Failor-Strafer Machinery Co.
132 Liberty St., - - New York, N. Y.

Boring mill, 72" Rogers, 2 heads.
Boring mill, 42" Bullard vert., 2 hds. 3 jaw table.
Drills, 30" Reed Prentice, upright m.d.
Grinder, No. 2 Brown & Sharpe, surface grinder.
Grinder, Oliver 4 wheel wood tool grinder.
Keyseater No. 1 Davis.
Lathe, 42"x24' Davis, m.d.
Lathe, 32"x14' Davis.
Lathe, 32"x12' Putnam, 3 step cone, d.b.g., hvy. du y.
Lathe, 32"x11' American, triple geared, hvy. duty.
Lathe, 30"x14' Davis, cone drive.
Lathe, 26"x10' Bridgeford, 3 step cone, taper attach.
Lathe, 26"x10' Walcott, 3 step cone, d. b. g., hvy. duty.
Lathe, 26"—48"x18' McCabe, two spindle.
Lathe, 24"x26' Greaves & Klusman, taper attach.
Lathe, 24"x14' American 3 step cone, d.b.g., hvy. duty.
Lathe, 24"x12' Porter, cone drive.
Lathe, 16"x5' Sidney, 3 step cone, d.b.g.
Lathe, turret, No. 2A Warner & S., bar equipment.
Lathe, turret 1" cap. Biggs hand screw mach., p. fd.
Miller, No. 2 Shields, high power, single pulley.
Nibbler, Gray, 3/16" cap., 30" throat.
Presses, 4 No. 3 Bliss Consolidated, inclinable.
Presses, No. O and OI, V & O inclinable.
Slotter, 15" New Haven, 30" table.
Variable speed drives, Reeves.

Reliance Machinery Sales Company
1407 Brighton Place, N.S. Pittsburgh, Pa.

Air compressors, 139 and 450 cu. ft.
Brake, press, 6'x16 ga. Robinson.
Grinder, Bath 12x32" univ.
Grinder, 16" Diamond face, arr. m. d.
Grinder, No. 14 Besley disc, 26" disc.
Hammers, 50 lb. Mayer upright, m. d.
Hammer, 100 lb. Lingle upright helve.
Hammer, 400 lb. Bliss, board drop.
Keyseater, No. 2 Baker.
Lathe, 27"x15' Reed-Prentice, arr. m.d.
Miller, 30"x10' Newton planer type.
Presses, No. 1 Toledo, O.B.I.
Press, No. 21 Bliss, 2" stroke.
Press, No. 21½ Bliss, blanking, m.d.
Press, horning, No. 40 Bliss.
Press, No. 82-C Toledo dbl. crank, 5" shaft, 44" wide.
Punch, 48" throat Whiting, 1" thru 1", arch, jaw, belt or motor drive.
Slotter, 15" Bement, crank, 36" rot. table.

What do you need? What have you for sale?

FOR SALE BY

Machine Tools Sales Company
513 N. 17th St., Philadelphia, Pa.

511' 18x9x10 Chi. pneu. O-CB, mtr. dr.
Auto. 6-A Potter & J., (2).
Auto. 3½" Grid. sgl. spdl.
Auto., 2½ Grid. sgl. spdl.
Auto., 5/8-7/8" Model A Cleve., Ser. over 30,000.
Bolt cutter, 3" Landis, gd. m. d.
Bor., No. 3, 6" bar Barnett hor., cyl., m.d.
15 ton 40' span Niles OET.
5 ton 28' 1½" span Roeper.
Drill, No 2 round col. Avey sgl. spdl.
Drill, radial, 3' American, c.d.
Drill, radial, 8' Sellers, m.d.
Gear box, 10-20 h. p., 7 speed, suitable for machine tool drives.
Grinder, 10"x36" Landis pl. self-cont.
Grinder, No. 3 Landis univ. 12"x32" c-shaft.
Grinder, Fischer, form cutter.
Grinder, 7-5/8x16" Sichel, hob.
Hammer, 1400 lb. Sellers steam forg.
Hammer, 600 lb. N. B. P. sgl. frame forg.
Hammer, 300 lb. Sellers steam forg.
Heads, planer, new, various sizes and types.
Heads, vert. boring mill, new, various sizes and types.
Lathe, 36"x17' New Haven, c.d.
Lathe, 26"x14' Bridgeford pl. turn., m. d.
Lathe, 24"x82' gun boring, m.d.
Lathe, 20"x8' Prentice, gd. hd.
Lathes, 20"x6' Springfield mfg., (2).
Lathes, 18"x6' Springfield mfg., (2).
Lathes, Porter Cable mfg., (2)
Lathes, American Fox, cone, (2).
Lathes, No. 2 Warner & Swasey, cone.
Lathe, Bardons & O. facing, cone.
Lathe, 24" Steinle tur., 6 spdl.
Miller, No. 3½, 72" Pratt & W. dble. spdl.
Miller, No. 2 M Potter & J. mfg., s.p.d.
Miller, No. 9 Kempsmith plain.
Miller, Whitney, geared hand, cone.
Miller, thd, 11"x24 foot Milled Screw Co.
Miller, thd., No. 23, 6" Smalley gen., 6" spdl.
Planer, 54"x54"x15'6" Sellers, 3 hds.
48"x48"x16' D. & H. openside, 3 hds.
36"x36"x14' Hamilton, 3 hds.
Planer, 22' No. 2 Hilles & J., plate.
Punch, Camden dbl. end., sil. fr., 45" th.
Punch, Pels, No. 26, 24" th., cap. 1-3/8" thru. 1", arch. jaw.
Punch, No. 6 Hilles & J., 62" throat.
Roll, 10'x8" Teal pyr., drop end.
Saw, 9"x9" Peerless hack.
Slotter, or vert planing machine, 72" Newton, m.d.
Slotter, 16" Betts, crank.
Slotter, 12" Bement, crank.
Strip mill, 16"x24" Bliss 2-hi., cold.
Thinner, Sellers, drill point, m.d.
Tire setter, No. 6 West hydr., 18 cyl. 30" to 63" with Triplex pump.
Tool rests, new comp., 4 pos., for wheel lathes. (2).
Truck, 6000 lb. 72" tier lift, auto. trans.
Truck, 6000 lb. 60" tier lift, Lakewood Eng.
Trucks, 6000 lb. 60" tier lift, Baker, (2).

The Norton-Broadway Machinery Co.
610 Baymiller St., - Cincinnati, Ohio

Boring mill, No. 25 Giddings & Lewis horizontal, 2½" bar, belt drive.
Lathe, 16"x8' (19½" swing) American quick change, three step, double back geared, 2 chucks, serial No. 32304, motor bracket.
Turret lathe, No. 3 Foster, ball bearing, rebuilt, with bar feed, roller bearings, three belts.

FOR SALE BY

Joseph Hyman & Sons,
Tioga and Almond Sts., Philadelphia, Pa.

WORLD'S LARGEST STOCK
POWER PRESSES

Marquette 4 point suspension press, tie rod, 8" stroke.
Bed 72" R to L x 66½ F. to B. pneumatic air cushion in bed, weight 73,000 lbs.
No. 65 K Niagara, gap, grd., double crank, 72".
No. S 126 Ferracute, dbl. crank 124", crank 7½"—9".
No. 109 Consolidated gap, d.c.
No. 106 Bliss gap, double crank, geared.
Nos. 92B, 92B, 91C, Toledo double crank presses.
No. 76½ Bliss, geared, straight side.
No. 56½ Consolidated, geared.
Nos. 74½, Bliss straight side.
No. 1½ Bliss, toggle press.
No. 164½ Toledo, toggle press, tie rod.
No. 164½ Toledo toggle press.
Nos. PA3 Ferracute & 13 Toledo horning. (3)
No. 25½ Bliss-Consol. horning.
No. 662 Toledo, 250 ton knuckle joint, coining.
75 ton EG51 & E51 Ferracute.
400 ton Perkins, coining.
250 ton & 150 ton Waterbury Farrel, coining.
No. 23 Bliss, 250 ton, knuckle joint.
150 ton EG52 Ferracute, knuckle joint.
Hammer, No. 4B Nazel, m.d.
Punches & shears, single & double end.
Squaring shears, various sizes.
These and hundreds of others of popular makes and sizes, are in stock at our warehouse here.
Rebuilt and Guaranteed.

Wm. C. Johnson & Sons Machy. Co.
1211 Hadley St., St. Louis, Mo.

Air compressors, 15 in stock.
Bolt threaders, 1", 1½" & 2" Acme.
Brake, press, L&N, 10', 10 ga.
Drill, Natco 13 spindle, No. 1 taper.
Drill, No. 2 Fox, 6 spindles.
Drills, radial, Dreses, 3' & 4'.
Drills, radial, Fosdick, 3'.
Drills, radial, Drillmaster, new.
Grinders, 10"x30" Landis.
Grinder, Walker 12" rotary.
Grinder, Rivett internal.
Hammers, 200 lb. Beaudry, 75 lb. Bradley, 50 & 100 lb. Little Giant.
Lathes, 14"x6' Monarch, q.c.g.
Lathes, 14"x6' American, q.c.g.
Lathes, 18x10' Sidney, q.c.g.
Lathes, 20x8' Le Blond, q.c.g.
Lathes, 24x16' Lodge & Shipley, q.c.g.
Lathes, 26—48x18' McCabe 2 spindle.
Lathe, 32"x14' Schumacher & Boye.
Lathes, 80x14 New Haven.
Lathes, 62" Niles locomotive wheel.
Miller, No. 1½ American.
Miller, No. 3 Knight vertical.
Miller, No. 0 Sieptoe.
Miller, No 2½ Fox.
Pipe machines, 2"—4"—6"—8"—12".
Pipe machine, 2" Landis.
Planer, 34x32x10' Hamilton.
Planer, 30x30x10' Liberty.
Planer, 30x30x8' Powell.
Press, wheel, 400 ton 84" Niles.
Press, wheel, 200 ton 48" Niles.
Punches, shears, bulldozers.
Roll, plate straightening, H. & J. No. 2, like new.
Rolls, 16' Whiting, 12" & 9½" rolls.
Rolls, 12' Pyramid, 14" & 10" rolls.
Saws, 6x6 Peerless, 12x18 Racine.
Shapers, 12"—16"—20"—24".
Large stock guaranteed electric motors. Any size.

FOR SALE BY

Bleser Mfg. & Machine Company
112 N. 12th St., - Springfield, Ill.

Lathe, 19"x12' Greaves-Klusman, l.c. $495
Lathe, 19"x8' Schumacher, Boye & Emmes, l.c. 350
Lathe, 30"x10' Bradford, l.c.g. 375
Molding machine, International 24x8P—Air operated.
Shaper, 32" American, shift. belt type 495

C. R. Daniels
1514 W. Capitol Drive, Milwaukee, Wis.

Air compressor, 10x10 Gardner horizontal, s.s., m.d.
Drills, 8" Canedy-Otto bench, m. driven, $40.00.
Shear, new 52"-16 ga. Pexto, foot power square, $260.00
Tapping machine, 1" cap. Cincinnati, floor type.
Tapping mch., new T-15 Buffalo, m.d., $140.00.

Box 160, c/o Hitchcock Publishing Co.
508 S. Dearborn St., - Chicago, Ill.

Wanted by manufacturer of machine tools A-1 machine shop foreman. Must be capable of supervising tool room and machine shop and must have complete knowledge of production machining. Plant employs approximately three to four hundred men. Reputable concern located in Chicago area. State full experience and previous places of employment. Will not contact former employers.

S. M. Regar Machinery and Mill Supplies
Tampa, - - - - Florida

Boring mill, Bickford, hor. spd., g. b., tbl. type No. 232.
Boring mill, Binsee No. 78 hor. knee type, 3½" spindle.
Boring mill, Bullard 42" vertical, 1 swivel 1 plain head.
Boring mill, Niles 36" vertical, 2 swivel heads.
Hammer, Lingle 50 lb. power, arranged m. d.
Hammer, Little Giant 50 lb. power.
Radial drill, Harrington 5 ft., no base.
Slotter, 16" Bement Miles, circular table 36".
Cold saw, Higley, m. d. No. 27", 36" takes 30" blade.

The Nutmeg State Machinery Corp.
1041-1051 State St., New Haven, Conn.

Boring mill, Espen Lucas No. 26, 4" bar with ex. table.
Grinders, Bryant No. 30, chucking, 35" swing, motor driven by 3 motors, (3).
Grinder, Brown & Sharpe No. 2 universal.
Grinder, Cincinnati, 12"x36" universal.
Thread millers, Pratt & Whitney 6"x48", complete with gears, pumps, tanks, countershafts, (2).
Turret lathe, Pratt & W. 2½x26", grd. bd., complete.

Capitol Machinery Exchange
401 Broadway New York, N. Y.

Blueprint machine, Paragon-Revolute.
Grinder, Blanchard vertical surface.
Grinder, Landis 16"x48", m. d.
Lathe, Reed-Prentice, 16"x8', g. h., m. d.
Lathe, Rahn-Larmon, 29"x10' g. b., m. d.
Lathes, LeBlond, 12"x8', 20"x8'.
Millers, Becker No. 5-C vert., No. 3 plain.
Shapers, Steptoe, 16", 24".
Turret lathe, No. 6 Warner and Swasey.
Turret lathes, Acme, 1", 1¼", 1½", 2½".
Turret lathes, Pratt & Whitney, 2", 3".
Other machinery in stock.

FOR SALE BY

Foster Machinery Co.
3982 Bluestone Rd. Cleveland, O.

Bulldozer, Williams & White No. 4, double end.
Forging roll, No. O.C. Ajax.
Lathe, 13x6, South Bend.
Punch, Long & Alstatter, 36" throat, 1½" cap. arch jaw.
Saw, 6" Newton, cold.
Saw sharpener, 11S Cochrane & Bly.
Welder, 1" butt.

Ogden R. Adams
264-6 State St., Main 6374-5
Rochester, New York

30" Bullard vertical turret lathe with one head on rail, thoroughly rebuilt.

D. E. Dony Machinery Co.
47 Laurelton Rd., - Rochester, N. Y.

Diamond boring machines, Coulter.
Drills, L. & G. 1-spindle No. 1.
Drills, L. & G. 2-spindle No. 1.
Gear hobber, No. 1 Adams.
Thread millers, trundle type.

S. M. Regar Machinery and Mill Supplies
Tampa, - - - - Florida

Lathes, LeBlond 17" & 19" rapid prod. q. c. feeds, (3).
Lathes, National 15" production, (2).
Lathe, Gisholt, 24", hole in spindle 6".
Lathe, Bement Miles, l. c. g., 36" factory raising blocks, 44"x22".
Lathe, Bullard 22", loose change, turret head.
Lathe, Mueller 20" quick change, 4 way tool post.
Lathe, Jones and Lamson 2½x24".

O. T. Webb Machinery Co.
743 N. 4th St., - Milwaukee, Wis.

Lathe, 15"x6' Cin. Champion, q. c. g. $285
Lathe, 24"x16' loose change gear, ck. 300
P/Press No. 4 S. S., R. & K., 2½" s. 200
P/Press No. 10 Bliss, o. b. 100
Shaper, 20" Cin., b. g., good 725

Russell Machine Co.
438 Oliver Bldg. Pittsburgh, Pa.

Boring mill, 42" Bullard, 2 swivel heads, s.p.d.
Boring mill, horiz., 5½" bar Niles, floor type.
Boring mill, horiz. 3-3/8" bar D&H, floor type.
Boring mill, horiz. 5" bar Barrett, b.d.
Gear cutter, spur, 84" Newark, m.d.
Gear planers, bevel, 54" Gleason m.d., (2).
Hammer, 300 lb. Bradley, upright strap.
Hammer, 1500 lb. Bliss board drop.
Lathe, 46"x17'6" Pond, p.c.g., triple grd., b.d.
Planer, 36"x36"x14' Gray, 4 heads, b.d.
Press, hyd. wheel, 300 ton Chamberaburg, m.d.
Press, dbl. crank, 79-D Stoll, 3" str., m.d.
Punch, beam, Cleveland, cap. 24".
Shaper, 24" American high duty, b.d.
Shear, Alligator, No. 61 Carlin high knife, 2½" sq.
Slotter, 18" Bem. Miles, table 36" dia., b.d.
Straightener, No. 1 Shuster flat strip metal, m. d.
Upsetting machines, 2½, 3½, 4 and 5" Ajax iron bed.

USED AND REBUILT MACHINERY

FOR SALE BY

Trojan Steel Company

P.O. Box 564 Charleston, W. Va.

Drill, 6' Reed Prentice radial, b. d.
Hammer, 500 lb. Beaudry, b. d.
Hammer, 200 lb. Beaudry, b. d.
Plane, New Haven 30"x30"x9', b. d.
Shear, splitting, Ironton, ¾ plate, 12" blade, b. d.
Slotter, 12" Putnam, b. d.

Bauer Machinery Company

1116 Frankford Ave., Philadelphia, Pa.

Drill, Henry & Wright, 24"x24" table.
Drill, radial, Fosdick 3', c.d.
Drill, radial, Bickford 3', c.d.
Grinders, internal, power feed to table, 10" swing, 12" feed, b.d., (8).
Grinder, No. 60 Heald, b.d.
Lathe, 27"x20', p.c.g., b.d.
Lathe, 21"x8' Sidney, q.c.g., d.b.g.
Lathe, turret, 16" Pratt & Whitney, 1¾", h. s., cross sliding turret, b.d.
Lathe, bench, brand new, high precision, 8½"x30" complete with collets up to 1"
Milling cutters, 9"x14" & 9"x19" with ins. h. s. blades.

Factory & Mill Supply Co., Inc.

176 Federal St., - Boston, Mass.

Milling machine, No. 2-M Potter & Johnson, auto.
Planer, 48"x48"x12' Betts, 3 heads, m.d.
Planer, 48"x48"x11' Pond Plainfield 3 heads, b.d.
Planer, 60"x60"x12' Pond, 2 heads, m.d.

W. E. Brandt, Machinery Sales

513 Empire Bldg. - - Pittsburgh, Pa.

Bending roll, 10'x¼" drop end
Bending roll, 12'x¼" pyramid type
Bending roll, 12'x1¼" Wickes pyramid, drop end, m.d.
Brake, leaf, 10'x10 ga. D. & K., belt drive.
Brake, press, 10'x¼" Verson Allsteel, m. d.
Brake, press, 12' 6"x¼" Ohl.
Brake, press, 8' 6"x10 ga. L. & N., m. d.
Crane, 10 t. 45' P. & H., 250 v., d. c.
Crane, 10 t. 50' Cleveland, 3/60/220 v.
Grinder, 10"x20" Landis universal.
Hammer, 100 lb. Bradley, cushioned helve, A-1 cond.
Lathe, 14"x5' Hendey, taper attachment,
Lathe, 16"x8' Hendey, taper attachment.
Nibbler, ¾"x36" throat Savage, m. d.
Shear, 10,x¼" United Engineering, 15" gap.

West Penn Machinery Company

Air compressors, 30 to 2500 cubic feet.
Air compr. portable gas I-R 160 cu. ft.
Bending roll, 9'x¼" Cleveland, m. d.
Blower, No. 4 Roots, capacity 2110 c. f. m.
Bolt cutters, 1½" 2" & 2½" Acme, b. d.
Boiler, 45 h p. Titusville 110 lb. pressure.
Boring mill, 24" Colburn, turret hd., b. d.
Bulldozers, Nos. 2, 4, 6, 9, 28, & 30.
Crane, 4 ton Shepard, 31'5" span, 440/3/60.
Crusher, jaw, No. 4 Champion, b. d.
Die filer, No. 3 Thiel, m. d.
Die sinker, No. 2 P&W., b. d.
Drill sharpener, Ing.-Rand "Leyner", 1¾".
Drill, radial, 5' American, semi-univ., b.d.
Drill, radial 6 Reed-Prentice, single pulley drive.
Drills, upright 10" to 30".
Drill, No. 216 Baker, No. 5 M, T., b.d.
Engine, gas, 20 horse power Besemer.
Gear cutters, 11", 18" & 24" Gleason.
Gear tester, bevel 18" Gleason.
Grinder, "Kwick-Way" all purpose, m.d.
Grinder, drill, No. 31 Oliver, 1½", m. d., 220/3/60.
Grinder, internal, No. 60 Heald, b.d.
Grinder, knife 10' Bridgeport, m.d.
Grinder, roll, Farrel 20"x76".
Grinder, surface vertical, 30" table, 16" wheel, m.d.
Grinder, No. 2 tool & cutter, Greenfield, b.d.
Grinders, D. E. 2—3 & 5 h. p., 220/3/60.
Hammers, 50 lb., 75 lb., 100 lb., 200 lb. Upright.
Hammers, Nos. 2-B, 2-B, 4-B, 6-B, Nazel.
Hammers, steam, forging & drop.
Keyseater, No. 1 Davis, 1"x8", m. d.
Keyseater, No. 1 Baker 1½"x12", b d.
Lathe, precision, No. 3½ Rivett, b.d.
Lathe, bench, 11"x4' South Bend, m. d.
Lathes, speed, 11" and 13" Blount, m. d.
Lathe, brass 18x6", friction head, power feed, b. d.
Lathe, 16"x12' Rahn-Larmon, geared head, t. a.
Lathe, 16"x12' Hendey, grd. head, t. a.
Lathe, 20"x10' Springfield, t. a., m.d.
Lathe, 24"x10' Lodge & Shipley, q.c.g., d.b.g.
Lathe, 26"x18" Pittburgh, d.b.g., t.a., b.d.
Lathe, 42"x16' Schumacher Boye, q. c. g., belt drivr.
Lathe, Lo-Swing, 6"x60", a. p. d.
Lathe, roll, 42"x20' United, m.d.

1210 House Building, Pittsburgh, Pa.

Lathes, turret, Nos. 1, 2 and 3 W. & S., b. d.
Lathe, turret H-21" Gisholt, 3½", b.d.
Locomotive, gas, 6 ton Milwaukee, 36".
Miller, shaper, duplex, No. 14 Cochrane-Bly, m.d.
Miller, Lincoln No. 32 Kempsmith, b.d.
Miller, Lincoln, No. 5 Hendey, b.d.
Millers, plain, No. 13½ Garvin, b. d.
Miller, vertical, Burke, table, 16x6, b. d.
Mixers, Sprout-Waldron, batch & liquid.
Nibbler, No. 1 Campbell 3/16", 6" gap, m. d.
Nibler, L.&A., ¾", .36" throat, m.d.
Pipe mche., 2", 4", 6", 8" 12" & 16" Landis-Oster-Williams.
Planer, 24"x24"x6' Gray, 1 head, b.d.
Planer, 30"x36"x12" Cincinnati, 2 hds., b.d.
Press, forging, 150 ton United, steam hyd.
Press, toggle, 525 ton Garrison, b.d.
Press, screw, No. 87 Niagara, hand power.
Press, strip feed, No. 31-C McDonald, b.d.
Pumps, centrifugal 6", 4", 1", motor drive.
Punch, EF Cleveland, 36" throat, 1½" thru 1".
Punch, multiple, 32E W & W, 10'2".
Riveters, air, hammer, spinning.
Rolling mill, cold 9"x15" motor drive.
Saws, friction, Nos. 2, 3 & 4 Ryerson motor drive.
Saw, metal band, Laidlaw, m.d.
Shapers, 16", 20", 24" & 36" Gould & Eberhardt.
Shears, alligator, 1½", 2", 3", 4" & 6".
Shear, Angle 6x6x1 Long & Allstatter, m. d.
Shear, Niagara 42"x14 ga., belt drive.
Shear, Stoll 60"x3/16", motor drive.
Shear, 84"x1" H. & J. 36" gap, m.d.
Shear, plate, 96"x 1¼" Morgan, 22" gap.
Shear, guill, No. 2 H. & J., 24" rd. b. d.
Shear, guill., 4'x4" Newbold, b.d.
Shear, throatless, No. 114-M Marshalltown, ¾", m.d.
Shear, up-cut, 22" Aetna, m. d.
Straightener, 12'x1" Shuster, b. d.
Straightener, 12'x1" Shuster, b. d.
Straightener, 60" McKay, 17 rolls 4½", m. d.
Straightener, 84"x1" Bertch, m.d.
Straightener, 1" Kane & Roach, m. d.
Testing machine, 400,000 lb. Riehle, b. d.
Tumbling barrel, 34"x48", belt drive.
Upsetters, 1" to 6".
Welder, spot, 12 K. V. A.

FOR SALE BY

The Reeve-Fritts Company

28 N. Clinton St., Chicago

Broach, No. 3 horiz., belt drive.
Centering machine, 4" Whiton.
Die head 2½" Geometric.
Drill, radial, No. 3 Barnes, horiz. duplex.
Grinder, Gisholt universal tool.
Hammer, 100 lb. Little Giant upright.
Lathe, No. 4 Hardinge, 4" precision.
Polishing mach., Blevney, 6" belt.
Saw, cold, No. 15, Lee-Simplex, 5½" cap.
Tapper, No. 1 Garvin vertical, ½" cap.

Wiener Machinery Co.

237 Centre St., - New York City

Lathe, Hendey, 24"x10', raised 30" swing, yoke hd. q.c. Lathe, turret, Gisholt, univ., timken br., m. d., 2" cap. Lodge & Shipley, selected g. h., 24"x12', arr. for m. d. Radial drill, Fosdick, s. p. d., thru gear box.

B. W. Matson Machinery Sales

135 West Wells St., Milwaukee, Wis.

Natco No. 13C, 14 spindle, 12x18, with index table, m. d., (2).
Boring mach., Auto. Mach. Co. vert. hyd. fd., m.d., (2)
Drill, Columbus Tool & Mach., 8 sta. vert., turret, m.d.
Grinders, Pratt & Whitney 5" auto. thread, m.d., (5).
Lathes, Auto. Mach. Co. auto. thread, 13x6', m.d., (6).
Press, oil gear type SK., hor., 60", 20 ton, m.d.

No. 3 GISHOLT DYNAMIC BALANCING MACHINE

80" between centers. 90% new.

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Drill, Automatic, Sensitive, with motor, hi. spd., cap., 3/16" ..... **$150.**
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Drill, 2 spd. Allen H. S. B. B. 14" Swing, No. 2 M. T. ..... **$300.**
Radial Drill, 2' Fosdick, M.D. 220/60/3 ..... **$750.**
Radial Drill, No. 7 4' Prentice M. D. 220/60/3 ..... **$1500.**
Gear Cutter, No. 6 B. & S., Cap. 60"x11" ..... **$3500.**
Grinder, Cleveland Relief, M.D..... **$550.**
Grinder, 12"x24" Plain B.D. No Name. **$250.**
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Grinder, Disc, Besley No. 8, 20" discs, two univ. tables, b.d. ..... **$250.**
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DIESEL DRIVEN AIR COMPRESSOR

1300 CFM, SULLIVAN AIR COMPRESSOR, angle-compound, direct connected to Fairbanks-Morse, Model 32, Style VA, Diesel Engine, vertical, 4-cylinder, 240 HP; all equipment.

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15″x8′ Cisco, Cone Drive, Quick Chg.
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20″x10′ Hendey Cone Q.C.
20″x10′ Bradford, Cone Drive, Quick Change.
24″x10′ Bradford, Cone Drive, Quick Change.
21″x10′ LeBlond, 3 S.C.D. D. B. G.
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30″x14′ Lodge & Shipley, Cone dr., quick change.
30″x16′ Lodge & Shipley Cone Q.C.
36″x12′ Lodge & Shipley, Cone dr., Trip. Grd. Q.C.
36″ raised to 52″x24′ Johnson Trip. Grd. Lathe.
20″x8′ Lodge & Shipley Pat. Hd. Q.C.
14″x6′ Vernon, Cone drive, Q.C.
24″x10′ Greaves Klusman 3 S.C.D. D.B.G. Q.C.
24″x10′ American, 3 S.C.D. D.B.G. Q.C.

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16, 20, 24″ G & E Shapers, cone dr.
16, 20, 24 and 28″ Gould & E. Shapers, S.P.D.
24″ Queen City H.D. Shaper, C. Dr.
24″ Hollingsworth H.D. Shaper, C. d.
20″ Cincinnati Shaper, Cone drive.
21″ Smith & Mills Shaper, Cone dr.
17″ Smith & Mills Shaper, Cone dr.
30″x30″x8′ Gray Planer, One head.
30″x30″x10′ Cincinnati Planer, B.D.
32″x32″x8′ Woodward & Powell Pl., B.D.

RADIAL & UPRIGHT DRILLS

2½′ Cincinnati Bickford Upright Radial Drill.
21″, 24″ Cinc. B. Upright Geared Fds.
24″ Barnes Upright Drill.

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No. 1, 2, 3 Adams Farwell Gear Hobs.

GRINDERS

Gardner 7½ H.P. Disc Grinder, Mechanical tables.
6″x18″ Ott Plain Grinder.
6″x18″ Landis Plain, Self Contained.
53″ Besly Ball Bearing Vert. Spindle Disc.
No. 55 Heald Internal Grinder.

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No. 4 Cinc. Hi. P. Cone 3 S.C.D. D.B.G.
No. 4 Cinc. H.P. Cone Univ. 3 S.C.D. D.B.G.

BORING MILLS

No. 2 Niles Boring Mill, A.C. M.D.
84″ Pond Vertical Boring Mill.

TURRET LATHES

Pierce 1″ capacity Bar feed & mtrzd.
5A Potter & Johnson

MISCELLANEOUS

1½″ Hayden 4 spindle Automatic Screw Machine.
2½″ Landis Bolt Cutter.
No. 4 & 5 Mitts & Merrill Keyseats.
Model W Cleveland Pch. & Shr. 60″ thrt., M.D.
6′x3/16″ Chicago Bending Brake.
No. 92D Toledo D.C. Press.
No. 4A High Speed Riveter New.
2—No. 35 Niagara Presses New.
No. 36 Niagara Press New.
3-¾″ Hayden Five Spindle Automatic Screw Machines.
Quickwork Rotary Shear, M.D.
13″x13″ Peerless Saw.
8″ Atkins Saw.
6″x6″ Peerless Shaping Saw.
35 K. W. Federal Spot Welder.
3″ Landis Bolt Cutter, Cone drive.

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BORING MILLS—HORIZ.

5" Bar Barrett Horizontal Boring Mill. Cap. in length 6'. Width of table 60"

6" Bar Heavy Duty Barrett Horizontal Boring Machine. Arr. M.D. Work Table 13'x6'1"

BRAKES—PRESS TYPE

12' Ohl. B.M.D. Cap. ¼"

BUILDINGS

48'x120' Steel Building. Heavy Construction

48'x160' Steel Building. Heavy Construction

NO. 9 WILLIAMS & WHITE BULLDOZER
Arr. M.D. 24" stroke
108"x20" Face of Crosshead
Including 40 H.P. A.C. Mtr.

CRANES

3 ton P & H Span 220/3/60 A. C. 29'6"

5 ton P & H Span 220 Volt D. C. 60'

7½ ton Northern Span 230 Volt D. C. 46'9"

10 ton P & H Span 230 Volt D. C. 29'7"

10 ton Alliance Span 220/3/60 A. C. 32'3¼"

10 ton Toledo Span 220/3/60 A. C. 32'3¼"

15 ton Shaw Span 230 Volt D. C. 46'

15 ton Niles Span 220/2/60 A. C. Including Phase Changer 48'11-¼"

15 ton Bedford Span 220/3/60 A. C. 52'

15 ton P & H Span 220 Volt D. C. Aux. Hoist 60'

20 ton Case Span Hand Operated 55'

25 ton Niles Span 220 Volt D. C. 30'

30 ton Alliance Span 220/3/60 A. C. 10 ton Auxiliary 32'3¼"

50 ton Niles Span 220/3/60 A. C. 5 ton Auxiliary 30'6"

CRAWLER CRANE

Model 700 P & H Crawler Crane 1¼ cu. yd. shovel

CRANES—GANTRY

4 ton Link-Belt Steel Gantry Crane 100' Span 4 motors, 220/3/60

25 ton P & H type P Steel Gantry 50' span, 3 motors, 220/3/60

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½" to 7" Ajax, Nat. Acme St. Fr.

HAMMERS—BOARD DROP—STEAM DROP—STEAM FORG.

1000 lb. to 8000 lb. Chamb. B. & Sp. Erie. N-B-P Morgan

12" Niles
Pyramid Type Plate Bending Roll Motor Driven Incl.
25 H. P. Motor Drop End Housing Capacity 1" Plate

20' Covington Initial Type Bending Roll, Motor Driven
Bending Rolls, 24" Diameter Rising Roll 18" diameter
Drop End Housing Motor Drive
Steel Housings
Forged Steel Rolls

LEVELLER—HYDRAULIC

48"x12' Britten Hydraulic Horizontal Sheet Stretcher Leveller, Motor Driven. Complete with triplex hydraulic pump.

MILLING MACHINES—PLANER TYPE

48" Newton Horizontal Adjustable Rail Type, M.D. 59" Bet. Housings. Table 42"x12' 4" bet. pockets

48" Ingersoll Adjustable Rail Type, Arr. M.D. Table 104"x 10'

PIPE MACHINES

4" Landis, motor driven, complete with cutting 0" attachment and chamfering attachment

8" Standard Engineering Company Pipe Threading and Cutting Machine, arr. for M. D.

16" William Pipe Threading Mch., M. D.

PLANERS

42"x42"x12' Pond Three Head, T & L Pulley Drive

96"x96"x16' Betts, Two Head, Belt Drive

PRESSES—HYDRAULIC

300 ton Shell Piercing Press 4 column type. 46" Dia. of Ram. 48" stroke, 41"x65" between columns

500 ton United High Speed Forging Press Four Col. Type

760 ton Southwark, 41½x19" Between Columns

3000 ton Southwark Forging Press, 3 column, 17" dia. 7' between Columns, 15 stroke 30" daylight

No. 98F Toledo Double Crank Press
Tie Rod Construction
124" Between Uprights
12" Stroke
Complete with 40 H.P. Mtr.

PRESS—HYDRAULIC FLANGING

200 ton Southwark Hyd. Sectional Flanging Press. 2 Vert. rams, 1 horiz. clamping ram, 1 stripper ram. Table 54"x72"

PRESS—DOUBLE ACTING TOGGLE

No. 162 Toledo Punch Press. Bed Area 21"x21". Stroke of Blankholder 5", stroke of Plunger 8¼"

PRESSES—SINGLE ACTING—STRAIGHT SIDE

No. 166½ Consolidated, 6" Stroke 47" between Uprights

No. 10-C Bliss, 6" Stroke 84" between Uprights

PRESSES—MISCELLANEOUS

1 D-45 Ferracute Press. Horizontal Double end screw type 36" ram stroke

No. 6 Bliss Horizontal Reducing Press R. D. 8" stroke

No. 856 Toledo, rack and pinion press, Stroke around 5" to 36" Bed area 22"x22"

PUNCH—MULTIPLE

Hilles & J. No. 7, 98" Betw. Hous., 18" Thr. M.D. Cap. to punch 40 13/16" holes thru 1" plate. Equipment Thomas Spac. Table 22'6" long

PUNCH & SHEAR COMBINATIONS

No. 6 Whiting Arr. M. D. 36" Throat, Cap. Punch ¾" through ¾"

No. 8 Whiting Sgle. End, Arr. for M. D. 48" Throat. Cap. Punch 1" thru 1"

Style E Clev. Sgle. End. Arr. for M. D. 27½" throat. Cap. Punch 1" thru 1"

Style G Cleveland. Sgle. End. Arr. M.D. Throat 60", Cap. punch 2" thru 1"

ROLLING MILLS

10x9" Acme Four Stand 2 High

10"x12" UE&F Co. Sgle. Stand 2 high

16"x24" Bliss Sgle. Stand 2 high

16½"x22" Cold Strip Mill 2 stand 2 high

15"x38" Farrel Sgle. Stand 3 high rod mill

10" Lewis Bar Mill with 20" breakdown mill

10" Garrison Bar Mill 5 stand 3 high

16" Garrison Bar Mill 3 stand one 3 high and one 2 high

24" Mackintosh Bar Mill 2 stand 3 high

28" Mesta Sheet Mill steel Housings

SHEARS—BAR

No. 8 Beatty M.D. Cap. ¼"x30" Cold. Complete with run-out table. 190" long

Mesta Vertical Open Throat Sheet Bar Shear M.D. Capacity four 1¼"x8" Cold Bars. Complete with tables

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Tools are tipped with Tungsten Carbide, and are suitable for machining cast-iron, brass, bronze, aluminum, non-ferrous materials (such as hard rubber, bakelite, fibre), and tough alloy steels up to 500 Brinell hardness.

Left—100 Series

Left Hand-Reverse Image, Right Hand Shown

Tool No. RH	LH	Shank Size
R-100	L-100	¼x¼x2
R-101	L-102	5/16x5/16x2¼
R-103	L-104	⅜x⅜x2½
R-105	L-106	7/16x7/16x3
R-107	L-108	½x½x3½

Right—200 Series

Tool No.	Shank Size
200	¼x¼x2
201	5/16x5/16x2¼
202	⅜x⅜x2½
203	7/16x7/16x3
204	½x½x3½

Below—300 Series

Tool No.	Shank Size
300	¼x¼x2
301	5/16x5/16x2½
302	⅜x⅜x2½
303	½x½x3½

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6"x14" PRATT & WHITNEY
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No. 11 BROWN & SHARPE, Motor Driven
10"x24" LANDIS PLAIN, Self Contained

MILLERS

Model "B" BECKER VERTICAL
No. 2A REED-PRENTICE VERTICAL, with Bridgeport Head
No. 6 WHITNEY HAND MILLERS
Type B BRIGGS MILLERS, Long Table

LATHES

21" GISHOLT TURRET LATHE
18"x8' HENDEY, Serial No. 24760
38"x20' NEW HAVEN, L. C. G.
9" SUNDSTRAND MFG. LATHES, Grd. Hd.

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1-2-3-4-6-Spindle—all makes
No. 16 NATCO—16 Spindles, Motor Driven

GEAR CUTTERS

No. 3-36" BROWN & SHARPE
No. 1036—GOULD & EBERHARDT—36"

MISCELLANEOUS

No. 33 NEW BRITAIN CHUCKER
No. 0 BAKER KEYSEATER
36" GANG SLITTER
WALTHAM GEAR CUTTER
7" RHODES SHAPER, Motor Driven

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5"x30" Pratt & Whitney
10"x18" Norton Type "A"
10"x20" Landis
10"x36" Landis
12"x24" Landis
20"x72" Landis Roll
24"x96" Landis Roll

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No. 2 Brown & Sharpe
No. 3 Cincinnati

SURFACE GRINDERS

No. 4 Diamond
6"x10"x36" Norton Hydraulic

LATHES

14"x 8' American, Taper attachment
16"x10' Monarch
18"x10' Monarch Geared Head
20"x14' Lodge & Shipley
36"x28' Draper, Taper attachment

MILLERS

12" Cincinnati Manufacturing
5" Pratt & Whitney Automatic
No. 1-½ Valley City Plain
No. 5 Cincinnati, Plain
No. 13B Brown & Sharpe, Plain
No. 4B Becker Vertical
No. 4B Becker Vertical

TURRET LATHES

1"x10" and 1"x15" Pratt & Whitney
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2-¼"x24" and 3"x36" Jones & Lamson
No. 1B Foster Universal
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21" Gisholt
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AUTOMATICS:
4½" Cleveland Model "A"
12x6 J&L Hartness Chucker

BRAKES:
8'x3/16" Ohl Press Brake, large variety Dies; M.D.
3' Hand Box & Pan Brake, 14 ga. D&K
3' Hand Bending, 14 ga. D&K.

BORING MILLS:
40" Bausch Motor Driven
24" Bullard Vert. "New Era"

THREAD MILLER:
6x14 Pratt & Whitney
Smalley General 6" hole in spindle, Belt Drive

SHEARS:
No. 196 L & N 8'x16 ga., Foot Power with bolsdown; back screw gauges; front gauges
No. 296 Stoll, 8'x14 ga., with holddown, and gauges
Bliss 8'x3/16, geared, overdriven, gap Shear; 18" gap; weight 17,800 lbs.
No. 236 Niagara Geared, Under Driven, motor drive, 36x14 gauge
No. 236 Stoll Geared, Under driven direct acting, 36"x16 gauge
No. 136 Niagara direct acting, 36"x16 gauge
No. 142 Queen City Shear; 42"x 14 ga.
Wais & Roos 10'x¼ cap. Motor Drive; 40,000 lbs.
No. 748 Niagara Grd. M.D. (3) 48"x3/16" capacity
No. 236 Niagara Grd. Underdriven; M.D. 36"x14 ga.
10'x¼" Waiss & Roos M.D. 24" gap

IRONWORKERS:
No. 9 Buffalo Bar Shear, 2x2x ¼" angles
No. 1 Pels Hand Univ. Ironwkr.

DRILLS—

HEAVY DUTY UPRIGHT:
Foote Burt No. 21; extra height; like new
Snyder 36"; No. 5 Tap ;28" ;24"
Snyder 36" and 28"; also 24"
Barnes 24"; 21" sliding head
Barnes 24" Slid. Hd. 21" 20"
Cinc.-Bick. 28" Tapping Attch.
Cincinnati 24"; 21"
Aurora 24" with tapping spindle

DRILLS—Sensitive High Speed:
No. 3 Avey Sgl. & Mult. Spdl.
Avey No. 3, one, two and three spindles
Avey No. 2, one, two, three & six spindles
Avey No. 2 Sgl. & Mult. Spdl.
Lel. Gifford Single, 2 & 4 spindles
Leland-Gifford No. 2, one, two and four spindles
Henry & Wright No. 2, one and two spindle, class "K"
Henry & Wright Single, and two spindle No. 2
Fosdick No. 2 Super Speed with Tapping Att.
Moline No. 5 Hole Hog, 6 spdl. Rail
Harrington No. 2, 12 spindle Multiple, Like New
Fox Multiple Spindle. No. 2 M.T.: 8 spindles
Natco No. 11; 12 spdls., No. 1 M.T.
100 spindles additional Drills all sizes

RADIAL DRILLS:
4' Bickford 11" column
4' NBP 11" column; Semi-Univ.
3½' Silver 9" column
3' American 9" column
3' Mueller 9" column
3' Dreses 9" column
3' Dreses (Simplex)
3' Carlton Sensitive, M.D.
4' Dreses Flat Column

LATHES:
4"x104" LoSwing Fitchburg (2)
4"x60" LoSwing Fitchburg (3)
4"x48" LoSwing Fitchburg (2)
3"x42" So. Bend Bench Lathe
8"x36" American Bench Lathe
12"x5' Willard Geared Head
13"x6' P & W Cage - Makers
14"x6' Stand. Lathe Wks., cone
14"x6' Rockford, Q.C.G. cone dr.
14"x8' Hendey, Geared Head
14"x8' Cincinnati, Q.C.G., cone dr.
14"x6' L&S, q. c. g., cone
16"x6' L&S, 12 spd., grd. head
16"x6' Monarch Q.C.G. cone dr.
16"x6' P & W, plain chg.; c.d.
16"x6' Reed Plain Change; c.d.
16"x8' Cinc. Q.C.G., c.dr., Taper
16"x8' Cincinnati, Q.C.G., cone dr.
16"x10' Reed-Prentice, Q.C.G., c.d.
17x8' Sidney, Hy. Duty,Q.C.G.,c.
18x8' Chard, semi-q. c. g., cone
18x8 Mueller, Q.C.G. cone drive
18"x8' Mueller Pl. Turning, Heavy Duty
18"x8' Cisco, Q.C.G. cone drive
18x8' Hamilton, QCG, cone dr.; taper
18x12' Prentice, Pl. Ch., Taper
18x12' Hamilton, Pl. Change Chuck cone
19"x8' LeBlond Hvy. Duty Prod.
20x10' Davis, Pl. Change; c. d.
21x8' LeBlond Heavy Duty with Turret
24x12' Crawf.-Erie, QCG,cone(2)
26"x9' Bridgeford Q.C.G. cone d.
26x16' Greaves-Klusman Pl. Ch.

ROLLS:
84"x8" Pinch Type
84"x4" Rolls: slip type
48"x3¼" Rolls: slip type
36"x3" Rolls: slip type

PIPE MACHINES:
2" Chicago
2" Jarecki
2½" Landis
4" Curtis
6" Jarecki
6" Williams
12" Saunders

BROACHING MACHINES:
No. 4 La Pointe of Hudson
No. 3 LaPointe of Hudson

PAPER CUTTERS:
42" Acme, Power Clamp
24", 30", 54" Jacques Hand

GEAR CUTTING MACHINERY:
Adams No. 1 Hobber; 12" (2)
Whiton Spur Gr. Cutter No. 2
Whiton Automatic Univ. Cutter No. 2
Schuchart & Schutte 18" Hobber
Barber-Colman No. 12; M.D.,(3)
Barber-Col. No. 3 standard; b.d.
G&E 48" Cutter, fine condition

RIVETERS & HAMMERS:
No. 3R Marquette Riveting Press; back geared; M.D.Air Cushions
No. 80 Grant Rivet Spinner
No. 0 Grant Bench Type Rivet Spinner
No. 1A Rochester High Speed
No. 1B Rochester High Speed
No. 2A, No 3A, No. 3AHD, No. 4AHD, No. 5½B, No. 6B Rochester High Speed Hammers
No. 1 Campbell Nibber 3/16" 6" throat
15 lb. Bradley Upright
50 lb. Little Giant Upright
400 lb. Peck Drop Hammer with Auto Lifter
200 lb. Bliss Board Drop, poppet base (new)

AIR COMPRESSORS:
6x6 Bury, horizontal
6x6 Curtis Vert., twin
7½x6 Ing. Rand, type REI
9x8 Blaisdell-Bradford
10x10 Chicago, Pneumatic
12x10 Ingersoll Rand
10x8x7½ American "Fairhurst" High Pressure
14x14x8 American "Fairhurst" 500 CFM

ENGRAVER:
No. 3 Zeiss, Flat & Tubular Work; belt drive

SAWS:
Cochrane-Bly No. 1B, 2B, 4B Cold Saws
Laidlaw Metal Cutting Band Saw, M. D.
Peerless 6x6 belt dr.; cab base
Racine 6x6 (3)
Toledo 6x6 M. D. new High Speed Hack Saw
Peerless 9x9
Wallace direct connected M. D. 18" Band Saw
No. 11 C&B Saw Grinders (3)
30", 36" American & Sidney Band Saws
No. 4 American Band Resaw

PRESSES:
No. 5 American, S.S. Geared
No. 37½ Bliss, S.S. Geared
No. 37½ Bliss Plain Flywheel
No. 14 Toledo Horn
No. 25 Niagara Arch
No. 30 Bliss Arch
No. 21½ Bliss OBI, Grd. (3)
No. 21 Bliss OBI, Plain
No. 20B Bliss OBI, Plain
No. 20 Bliss OBI, Plain (10)
No. 19 Bliss OBI, Plain (2)
No. 18 Bliss OBI, Plain (2)
No. 2½ V&O Plain Press, OBI
No. 3 Amer. Can Co. Pl. OBI
No. 36 Niagara Back Flywheel
No. 46 Perkins Grd., Back flywh.
No. 16 Bliss Horn, M. D.
No. 14 Stoll, OBI
No. 3R Marquette, Grd. M. D.
No. 1 Bliss Toggle
6-ton General Flexible
12-ton General Flexible
No. 5 Greenerd Broaching
No. 4 Adriance, OBI, Plain
No. 75 Toledo OB, Geared
No. 75 Toledo, Open Back; Plain flywheel
No. 6 Waterbury-Farrel, OBI, Pl.

Partial Listing Only. Send Us Your Inquiries.

FALK MACHINERY COMPANY 18 WARD STREET ROCHESTER, N.Y.

"Ready to Ship" —B U T

Our stock of machine tools changes too quickly to offer a listing. Send us your inquiries because we are constantly in touch with the market.

MORRIS MACHINERY CO., Inc.

97 Chestnut Street, Newark, N. J.

NEED GOOD TOOLS? — SEE US FIRST

D-31 Fox multiple drill, rectangular head, 16"x31½" spindle centers. No. 2 Morse taper; 10 spindles, hand and power feed to head.

AUTOMATICS, ⅞" B; and 2" modelA, Clevelands.

BOLT CUTTERS, 2" Landis.

DIES and MACHINES for rect. cans, inc 61 Ams flanger; 72 Ams double seumer; 126CD Adriance double seamer; 281 Adriance gang slitter; No. 114 Adriance Automatic Double Seamer 10" round cans.

DRILLS, 36" Cincinnati, back geared sliding head, tapping attachment; 4 ft. Dreses plain radial gear box drive; No. 4 Quint six spindle turret drill; No. 4 Morse tapers; 2 sp. Leland Gifford Ball Bearing left H. sp. with tapper

ENGINE LATHES, 22"x10' Davis dble. back gear quick change; 38"x14' Fifield 14" 6' Monarch, plain change; Four 9'x20" Porter Cable Production lathes with back facing attachment.

MILLING MACHINES, No. 3½ Pratt & Whitney duplex, 60" table, 27" extreme between spindles; No. 1 Newton slab, 65" table feed.

TURRET & MONITOR LATHES, two 21" Gisholt turret lathes, 3½" bore in spindles; two 3"x36" Jones & Lamson; 16" Dreses, Fox Monitor chasing bar; No. 1 Am. Tool & Mach., Fox Monitor chasing bar.

PLANERS, 24"x6' Pond, one head; 36"x15' Betts two heads.

PIPE MACHINES, 3" Bignall & Keeler; 4" Saunders; both belt drive.

PRESS, No. 1 Bliss Cam Drawing Press —geared arranged for motor drive; EG. 52 Ferracute Embossing 150 ton 1½" stroke

SLITTER, Model G-36 Yoder gang slitter, motor drive with straightening rolls; 6 sets cutters.

SAND BLAST, C-36 New Haven 36"x44" Radial Sand Blast Barrel M.D.

SEPARATOR, 3 McKenzie chip production.

THREADING MACHINE, H & G Threading

WELDERS, two Gibbs spot welders, 18" throat 12 KVA.

Many other tools—exceptional "buys"—write for full details.

A. D. White Mchy. Co., 108 N. Jefferson St., Chicago, Ill.

Established 1894

Good Used Machinery

ARC WELDER—G. E. 200 amp., m.d.

BORING LATHE—Springfield 14"x10' bed 7" hole

BORING MILLS—Baush 44" m.d. Bullard 51" Vert., 2 hds., Bullard 42" Mill, vert.; Rockf. No. 2 horiz., 3⅛" Bar; Colburn 42" Vert. 2 Hds.; Colburn 42" one head.

BRAKES—D. & K., 5' Box & Pan, 14 ga. Keene 10' 16 ga. Toggle Press.

CUT-OFF MACHINE—Davis 6" cap.

DRILLS (RADIAL)—Fosdick4', Carlton 4' all gear box dr.; Hammond 4' sensitive; Mueller 4½' g. box; Morris 3' Gr. Box

DRILLS (H. S. B. B.)—H & W 2, 4, 5sp.; Sipp 1 & 2 sp.; Allen 2 & 6-sp.; Avey, Demco, Lel-Gif. 1-sp.; Avey 2-sp.

DRILLS (MISC.)—Baker No. 217 (2) Hvy. Duty; Hamilton 42" S. H.; Barnes 20" & 24" 1-sp. & 20" 4-sp.; P W No. 12 Multi-Sp.; Natco 20 sp. Rect. head; P. & W. 24 sp. rectangular head Adj.

GEAR CUTTERS—B & S 26" s. p. d. automatic spur; Cincinnati 36" gear cutter. G. & E. 48" gear Cutter.

GRINDERS—P & W 12" vert. surf.; Cin. No. 1½ & B & S No. 12 univ. tool, B & S Nos. 11&16 pl. ; B & S No. 2 and Abrasive No. 33 Surf. Heald Nos. 60 & 65 Int.; Landis 10x30" Plain; B & S 10x48"; 3—Norton 6x32" plain; badger No. 220, auto. d. e., opposed disc (4); Norton 10" x 36". Diamond No. 2 Auto. Surf.; Ott 5"x18"

HAMMERS—Mayer 50-lb.; W & W 165 lb.; Kane & Roach 70 lb.; Beaudry 150 lb.

KEYSEATERS—Mitts & Merrill No. 5 vert. Davis No. 1; M. & M. No.0; M. & M. No. 2.

LATHES—Monarch 16"x10' M.D.; Lehmann 18"x9'; Amer. 22x8'; Davis 22"x10'; L & S 20"x10'; S-B & E 20"x10' q. c. g; Flather 22"x10'; LeBlond 16"x8'; Gleason 45"x12"; Monarch 16"x8' (2); Ryerson 20x10', m.d.; S.B.E. 30"x12' Q.C.G. Hendey 16"x8' C.H.; Hendey 16"x10' grd. hd.; Sidney 18"x8' and Flather 16"x8'. L. & S. 16"x8' M.D.

MILLING MACHINES—Ohio No. 29, Ohio No. 20, Cin. No. 3, Hendey No. 3, B & S No. 3, LeBlond No. 3H, Cinc. No. 1 s.p.d. Plain; LeBlond No. 4 M.D. C.D. & Cleveland; No. 2, s.p.d. Plain Cinc. 24' Auto. Plain; Model "B" Vertical; Owen Duplex; Ingersoll M.D. Slab Miller 4 hds.; Newton Vert. with rotary table; Becker No. 2 Vert.

THREAD MILLERS—Lees-Bradner No. 3 Collet Type; Smalley General No. 23-A; Moline No. 10

PLANERS—Gray 28"x28"x6' 1-hd.; Pond 32"x34"x10'; Sellers 36x36x12'; Pease 26"x26"x9'; Pond 54"x54"x12' 4 hds.

PIPE MACH.—Williams 6" cap.

PUNCH PRESSES — Ferracute No. P-4; Barouth No. 3 & No. 4 O.B.I.; Bliss No. 62; Toledo No. 5; Toledo No. 31 & No. 32; Fer. No. EGF 52 Coining; Willard No. 4A o.b.i.; Swaine No. 38 arch, and Bliss No. 68-N; Cons. No. 24 Blanking.

SAWS (HACK)—Peerless 6x6" H.S. (4); Atkins 8x8"

SAWS (COLD)—Cochrane & Bly Nos. 2-B & 4-B.

SHAPERS—S & M, G & E, Ohio, Mt., Q. City, Davis, Cin. 16"; Ohio & G & E 20"; S & M, Q. City, Rock, Cin. 24"; Ohio 26"; Cin. 24" s. p. qr. box; American 24" heavy, b.g. Amer. 15"; Springf. 15"; S.&M. 26", b.g. G. & E. 24", s.p., gearbox; Amer. 20"; Rockf. 24" gearbox.

SCREW MACHINES—8 Hand; Nat. Acme. Nos. 515, 4-sp.; B.&S. No. 4 Hand; Nat. Acme No. 52; Gridley 4-sp. ¾"; Cleveland 1-sp. 2¼" cap.

SQUARE SHEAR—D & K 10' 3/16" cap.

SLOTTER—Bement-Miles 10" vert.

TAPPING MACHINES—(2) Garvin No. 2 & 2X Vertical Automatic & Garvin No. 1.

TURRET LATHES—Baush 30" M.D.; Bullard 24" vert. rap. prod.; Potter & Johnston, 8½x16 No. 10; Libby 24", m.d.; Gisholt 24" swing 6¼" hole; P. & W. 2¼" hole grd. hd.

Above is only a small part of our large stock on hand

McDonald MACHINERY CO.
1531-35 N. Broadway ST. LOUIS, MO.

IF WHAT YOU WANT ISN'T HERE

Send Us Your Inquiry

BRAKES:
No. 183 Chicago 8 ft. 12-ga. pwr. leaf type
No. 34 Chicago 4 ft. 14 gauge, box & pan
2 ft. S-L 18 ga. hand

DRILLS:
Radial, 8cns, 3 ft. American
Radial, 3 ft. Fosdick
Natco Type K 20-spdl.
Rail, Foote-Burt Nos. 2 & 4, 4 spindle.
Prentice, 4-spdl. high-speed
Allen BB Type B sgl. spdl.
Demco DAH ¾" bb, M.D.
14" U. S. $35.00
20" Barnes B. G. & P. F.
24" Sibley & Ware B. G. & P.F.
25" Bickford, sl. hd. BG & PF
25" Gould & Eberhardt BG & PF
28" Hamilton sl. hd. BG & PF.

GRINDERS:
Cutter & Reamer, No 1 Cinci.
Disc, No. 6-20 Besly
Disc, No. 41 Besly, motor dr.
Disc, No. 220 Badger & press
Drill, New Yankee, D.E.
Elec., Hisey-Wolf 3-6 BOA BB
Flex. shaft, RA 5 Haskins
Emery, DE, Norton 24"
Emery, DE St. Louis 18"&20"
Internal, Madison: No. 65 Heald.
Plain Cylindrical, No. 2 Morse
Surface, No. 1 La Salle.

LATHES:
26"x14' Niles, PCG
20"x8' LeBlond QCG, DBG
20"x8' Bradford, PCG MD.
16"x8' Fay & Scott QCG
16"x8' LeBlond PCG
16"x6' Monarch DBG QCG
14"x6' Rumsey, PCG
9"x3' South Bend 420-Y MD.

LATHES—Turret:
2x24" Jones & Lamson
12" Reed-Prentice BG

PRESSES:
Arbor, Famco and Atlas.
Cam Drawing, 69-N Bliss
Dbl. Crank, No. 37 Excelsior
Foot, Famco and No. 4 Swaine
O.B.I. Wold, 1350 lbs.
Punch, No. 5 Bliss Stiles
No. 20 Excelsior 1" in ¼"
O.B.I. No. 1 L & J, new
O.B.I. No. 3 L & J, new

PUNCHES & SHEARS:
SE, Cleveland C ¾ in 2", 26" thr.
SE W-W 14½, 25" thr. 1 in 1" MD.
Rock River L, 24" thr. ½ in ½"
DE 1-10 Badger ½ in ½", 10" thr.

SAWS:
Band metal, 14" Racine
Cold, Higley, 20" saw, No. 17 Hack, No. 3 Robertson 6x6"
Hack, No. 14 Atkins 6x6"

SHAPERS:
16" Davis, sgl. pulley drive
16" Milwaukee B.G.
26" Hendy planer type dr.

SHEARS:
Dbl. action, No. 11 Excelsior, inside cutting, cap. 10 ga.
Rotary Bevel, Lennox ½"
Square, 48" Excelsior, pwr. cap.
Square, 38" Bertsch, power
Throatless, 18 H Marshalltown

THREADERS, Pipe & Bolt:
Murchey, ½" dbl. head, bolt
Pipe, 2" Oster No. 302

MISCELLANEOUS:
Bender, No. 15 Wallace, 1" cap.
Dbl. Seamer, Swaine, 36" cap.
Compressor, Herron-Bury CCB 14x9x8", 6' tank, 20 HP mtr
Hammer, 50-lb. Little Giant, MD.
Jacks, Lever Lift, 15 ton J. C.
Miller, No. 1½ Valley univ.
Planer, 30"x30"x8' Wheeler
Roll, Corrugating, 10" Robinson
Screw Mach., No. 2 J. & L.
Welders 2½, 5, 7½, 10 K W Dyer spot
Valve Refacer, ½" Black & Decker

Brown Mchy. Co., 2333 N. Ninth St., St. Louis, Mo.

MACHINE TOOLS FOR SALE

LATHES

1—14"x6' cone drive motorized with Cullman Drive Monarch Engine Lathe, q.c.g.
1—28"x12' Schumacher & Boye lathe, c.d., double back geared q.c.g.

TURRET LATHES

1—No. 3B Foster Turret lathe, all geared head, motor drive, power feed to hexagon turret and to side carriage, 5¼" hole through spindle.
3—26" Model C Libby Turret, s.p.d., all geared feeds and speeds, 7½" hole thru spdl.
1—18" Model A Libby Turret lathe, s.p.d., all geared feeds and speeds, 3 9/16" hole thru spindle.
1—No. 2A Warner & Swasey Universal turret lathe, s.p.d., all geared head, serial 141, 743, arranged for chucking work, hole through spindle 2¾".
1—1½"x9" Cincinnati Acme Screw Machine, friction screw head., c.d., motorized with Cullman Drive, equipped for bar work, chuck capacity 1½".
2—24" Steinle turret lathes, s.p.d. all geared head, 4" through spindle.
6—No. 4 W. & S. tur., c.d., fric. back grd., pw. fd. to hexn. tur., hand fd. to cross slide.
1—2¼"x24" Jones & Lamson Flat turret lathe, s.p.d., all grd. hd., equip. for bar work.

GRINDERS

1—No. 14 B. & S. Cyl. Grinder, belt drive, 10" swing, 18" grinding length.
1—No. 1 Brown & Sharpe Universal Grinder, arranged for 3 motor drive.
1—No. 3 Brown & Sharpe Universal Grinder, arranged for 3 motor drive.
1—12x36" Cincinnati Universal Grinder, arranged for 3 motor drive.

MISCELLANEOUS

1—20" Rockford Shaper, s.p.d. through gear box.
1—6' Bickford Plain Radial drill, s.p.d., through gear box, dia. of column 15".
1—No. CS Becker Continuous Vertical miller with 29¾" rotary table.
1—No. 32 Kempsmith Lincoln type milling machine.
1—No. 5A Lees Bradner Universal Gear Hobber.

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LAURENS BROS. **71st St. & Longview Ave., Cincinnati, Ohio**

BORING MILLS, Horizontal

4" bar No. 40 Landis M. D.
4½" bar N.B.P. Floor Type
4½" bar Bement Miles Knee Type
6" bar No. 3 Barrett M. D.

BORING MILLS, Vertical

14'-20' N.B.P. 3 M.D.
100" N.B.P. Hvy. M.D.
84" Betts, Heavy 77" swing
51" N.B.P. 2 hds., M.D.
51" Bullard, P.R.T.

DRILLS, Radial

5' N.B.P. Univ. M.D.
5' Ryerson, motor on spindle
5' Western S.P.D.
4' Fosdick, Pl. Gear Box
4' Dreses Plain
4' Western S.P.D.
No. 13 P. & W. Multi
36" & 32" Cinci. Uprights
2 spin. Hoefer, 21"
Bausch No. 30 Multi spin. 30" round head 8 spin.

GRINDERS

6' Reed Prentice Vert. Surface 78" feed, chucks.
15"x15"x96" Norton Open-side Surface, M.D.
16"x68" Landis Crankshaft
No. 6 Bryant Chucking
No. 6 Landis Cyl. Grinder
No. 3 Landis Universal
No. 2 Sellers Univ. Tool
18" Besly No. 26 Disc
20"x96" Landis Cyl. M. D.
20"x96" Landis Univ.
20"x216" Landis Cyl. M.D.
24"x 96" Landis Cyl. M. D.
30" x 240" Landis Roll M. D.
No. 11 Landis Tool & Cutter
No. 52 Greenfield "Hydroil" Int.
No. 55, 60 and 65 Heald Cyl.
90" Bridgeport Shear Knife

LATHES

9"x20" Porter-Cable
12"x6' Davis, M.D.
14"x6' Monarch Q.C.G., Cone
16"x6' Sidney, Q.C.G.
16"x8' South Bend, L.C.G.
18"x8' Whitcomb Bl. Grd. Hd.
18"x12' Amer. 3 cone, Dbl. Grd.
19"x12' LeBlond Grd. Hd.
20"x12' Amer. 3 cone
20"x14' Monarch, Q.C.G.
22"x12' Amer. 4 cone

LATHES (Continued)

22"/24"x12' L. & S., Q.C.G., M.D.
24"x10' Pittsbgh., Q.C.G., Cone
24"x10' Amer. Grd. Hd.
24"x12' Putnam Grd. Hd., M.D.
24"x12' Reed Prentice Grd. Hd., T.A., Q.C.G.
24"x15' N.B.P. Q.C.G., T.A.
24"/32"x24' LeBlond Q. C. G. Cone, raised in sand
26"x11' Wickes Heavy Cone
30"x12' L. & S., Cone, Q.C.G.
30"x16' N.B.P. Axel & Journal, Center Drive, M.D.
32"x18' Fifield, triple grd.
33"/47"x16' Putnam, Cone
36"x14' Rahn Larmon, Q.C.G., Cone
36"x27' Pond 2 carr., Cone
36"x27' Gleason, F. Plate Dr.
42" N.B.P. Center Dr., Whl.
48"/60"x14' Putnam, Heavy
48"x16' Fifield Cone
48"x20' Bement Miles Cone
90" N.B.P. Heavy, Wheel
Peerless Banding Lathe, M.D.
96"x30', Heavy Duty

MILLERS

No. 2 Cincinnati, Plain
No. 3 Newt. Miller, 30"x30"x8'
No. 3 Ingersoll Knee Type Vert. & Horizontal Spindle
3B K. & T. Universal
No. 4B Becker Vert.
No. 6 Becker Vert. M. D.
24" Cincinnati Semi Auto
42"x42"x8' Bement Pond, Adj. Rail Miller, 4 hds., hd.
No. 6 Jackson Die Sinkers (3)
No. 1 Standard Hand

PLANERS

60"x60"x14' Niles 4 hds.
42"x42"x16' N.B.P., M.D.
36" Newton Rotary, M.D.
36"x36"x12' Ryerson Opens.
36"x36"x12' Chandler, 3 hds.
30"x30"x10' D. & H. Openside
27"x27"x6' W. & P., 1 Hd.
24"x24"x12' American
16"x16"x48" Walter Bros.

TURRET LATHES

24"x26" P. & W. Grd. Hd.
No. 3 Bardons & Oliver Fox Lathe
No. 4 Bardons & Oliver Fox
No. 5 Foster, 1-13/16" capacity
21" Gisholt, 21" H.S., M.D.
24" Gisholt, 61" H.S., M.D.
24" Gisholt, 61" H.S., 2 cone
24" Steinle M. D.
28" Steinle M. D.
24"x24" & 3"x36" J. & L.
3"x36" P. & W. Bar

MISCELLANEOUS

Automatics, ⅜" Clevel. Model A
Automatic, 2¼" Gridley, 1 Sp.
Automatics, 2-¾" - 3-¾" Clevel. Model A Sgl. Sp. (2)
Billet Breaking Mach., Ajax
Bolt Threader, 2" Landis
Bolt Threader, 2" Natl.
Chucking, No. 34 New Brit.
Die Sinkers, No. 6 Jackson (3)
Gear Cutters No. 3 & 4 Adams Gear Hobbers
Gear Cutter, 110" Newton Spur
Header, 1¼" Acme Rivet
Header, 2" Acme Steel
Keystrs., Nos. 1 & 3 Bakers
Keystrs., Nos. 4 & 6 M & M, M.D.
Lapper, Norton Type 1C
Oil Groover, No. 1 Garvin
Pipe Machine, 4" Saunders No.4B
Pipe Mach. 8" & 12" Williams
Pipe Machine, 12" Saunders
Pipe Mach., 12" Curtis & C.
Pipe Machs. 3" Stover M.D.
Pipe Mach., 2" Bignall Keeler
Press, No. 3A Bliss, Dble. Ck.
Press, No. 61 Spec. V. & O.
Press, 400 ton N.B.P. 48" Horiz. Hyd.
Presses, No. 18 Bliss B. & Fl.
Punch & Shear, Schatz Cobn.
Punch, 1"x⅜" shears, ⅜" pl.
Punch 54" H & J No. 2 D.E.
Rolls, 6'x½" H. & J. No. 2
Rolls, 12' Corrugating—Heavy
Saw, 6" Avey Milband
Saw, 6" Gorton No. 2B Inter.
Saw, No. 15 Lea Simplex Cold
Shaper, 14" Steptoe
Shaper, 16" Kelly
Shaper, 36" Morton, railroad
Shaper, 32" Morton Draw Cut
Shaper, 28" Ohio Dreadnaught M.D.
Slotter, 14" Newton
Slotter, 15" Putn., D.C., M.D.
Slotter, 18" Newton, Hvy. D.
Slotter, 24" Dill A.C., M.D.

BENNETT-RAFKIN MACHINE TOOL CO., Inc.

Offices: 30 CHURCH ST., NEW YORK CITY

IN STOCK — FOR IMMEDIATE DELIVERY

AUTOMATICS
3" Gridley, Model F
1¼" Gridley, Model F (3)

BAND SAWS, Metal
No. 1 Klem; 10"x10" Napier

BORING MILLS
42" Niles Vert. Gr. Box, S.P.D.

DRILL PRESSES
Avey Bch. Type H.S.B.B. (10)
21" Buffalo, M.D.
20" Champion, B.G.
No. 11 P. & W. Multiple (2)
4 Spindle Leland-Gifford, M.D.
4 Spindle Barnes Camel-Back, All Geared, self oiling
No. 23 Foote-Burt High Duty

GRINDERS
5x18 Ott Cylindrical 4 Motors
No. 27 Gardner M.D. opposed disc
Disc, Nos. 4 & 6 Gardner, B. B.; 26" Badger, B.B.

HACK SAWS
Nos. 1 & 2 Marvel, S.P.D.
No. 3 & 7 Atkins, S.P.D.
6"x6" Peerless

LATHES
14"x6' Bradford, Q.C.G.
16"x6' American, Q.C.G.
16"x8' Bradford Grd. Hd., M.D.
16"x8' South Bend
18"x12' LeBlond
26" Prybil B.B. Spinning
26"x16' Bridgeford
27"x16' Lodge & Shipley, M.D.
42"x20' Wickes Grd. Hd. M.D.

MILLING MACHINES
1A K & T Mfg. M.D.
1½A K & T Mfg. M.D.
2B K & T Plain M.D.
No. 2 Kempsmith, Plain
No. 2½ LeBlond, Plain
No. 3 Kempsmith Universal
Chicago Hand Mills with Vert. Hd.
New No. 4 Burke M.D. Bench Melling Mill-Matic, M.D.
6x48 Pratt & Whitney thread

GEAR SHAPERS
24" Fellows (2)

NIBBLERS
No. 1 Campbell

PLANERS
42"x36"x12' N.B.P. with side head

PRESSES
PG2 Ferracute (3)
No. 13 Niagara Horn.
No. 41 Toledo Horn.
No. 20C Bliss O.B.I.
No. 4 Toledo O.B.I.
90B Toledo Dble. Crank

PUNCH PRESSES
Cam Drawing, No. 1 Bliss, b-g.
No. 32 Bliss Toggle

RADIAL DRILLS
3' American Sensitive
4½' American Sensitive, M.D.
4' Ryerson, S.P.D.

BENDING ROLLS
4' Rock River, M.D.
6' Rock River, M.D.

SHAPERS
3¼" Rhodes Slotter
16" Whipp B.G. M.D.
24" Steptoe, S.P.D.
24" Stockbridge, M.D.
28" American S.P.D.

SHEARS
No. 636 Niagara 3/16" cap.
No. 272 Niagara 14 ga. cap.
4" Cleveland Model B & A

TURRET LATHES
No. 2A W. & S. S.P.D.
21" Gish., 3½" hole 2 step cn.

WELDERS
Arc: 200 Amperes USL
Spot Welder 9 KW, AEF M.D.

MISCELLANEOUS
Acme Steel Banding Machine, Portable, M.D.
No. 054 Unishear, M.D.
4" Hurlbut-Rogers Cutoff
150 Ton Hydraulic Whl. Pr.
No. 5 Thiel Fil. Mch., M.D.
No. 1 Davis Keyseater
2—Meaker Lead Lined Variable Speed Tanks
No. 80 Grant Spinners
250 lb. Trip Hammer

VICTOR MACHINERY CO., 130-132 S. Clinton St. Chicago, Illinois

AVAILABLE !!!

LATHES
32"x18' Bridgeford h.d. Oil Country Lathe
32"x16' Fitchburg h.d. Lathe
14"x6' Flather, Q.C.G.
18" & 24"x10' Schumacher & Boye Lathes
24"x8' South Bend, h.d. L.C.G.
11"x4' Seneca Falls Short-Cut, M.D.

TURRET LATHES
No. 4 Bardons & Oliver, Hex Turret for Chkg.
21"-24"-28" Gisholt Univ. Tilted Type
26"x4½" Hole Libby Geared Head Full Universal Turret Lathe, Face Plates, Pot Chucks, Boring Bars, Turret Tools Rebuilt
6 A Potter & Johnson Auto. Air Chuck & M D. Serial 18814
No. 3 Superior Turret Lathe, Automatic Chucking Bar Feed
(3) Warner Swasey & American Fox Monitor type with complete equip. & auto. chuck

MISCELLANEOUS
75 ton Henry & Wright Dieing machine with double roll feed and scrap cutter
No. 3 Diamond Surface Grinder 48" Travel. All feeds
No. 2-Y Brown & Sharpe Plain Mill with V.Hd.
No. 3 Cincinnati Plain Mill (Knuckle)
No. 2A Becker Vertical Mill
2-3½" Bar Rockford Horiz. boring mills m.d. like new, with 6' stationary tables at right angles to spindle, travel of column contained spindle 6'
Production Milling Machines
36"x36"x8' Detrick & Harvey Openside Planer with 2 rail heads and 1 side head. Self-contained countershaft for b.m.d.
2½"-3" Buffalo Armour Plate Bar Shear M.D.
20" Walcott h.d. Shaper
20" Columbia Shaper, M.Dr.
20" Ohio Shaper, M.Dr.
(2) No. 5½B Hi-speed Riveters M.D.
No. 3 Brown & Sharpe Gear Cutter
32" Cincinnati Gear Cutter
(2) 900 Ton Zeh & Hahnemann Percussion Presses, M.Dr., 25" stroke Bed 36x50". Tie Rod, like new.
(2) 9x9" Peerless shaping saws

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BORING MILLS:
3" Fitchburg Knee Type Horizontal
4-¾" Niles Knee Type Horizontal

BORING MILLS—vertical:
44" Baush P. R. T., M. D.
42" NBP Standard, M.D.
42" Colburn Heavy Duty, M.D.

ENGINE LATHES:
36"x27' Pond Two Carriages
36"x27' Gleason
20"x14' Cisco, Geared Head
20"x14' Walcott, Geared Head
18"x 8' American, Geared Head
10"x 5' P. & W. Prod. Lathes

GEAR CUTTERS:
36" Gould & Eberhardt, M.D.
60" Gould & Eberhardt, M.D.
72" Gould & Eberhardt, M.D., (2)
No. 12 Barber-Colman Hobbers
Fellows Gear Shapers, Nos. 3, 6, 62

MILLERS:
No. C Becker Vertical M.D.
No. C-2 Becker Vertical M. D.
No. 2V P. & J. Automatic Vertical
No. 24 Brown & Sharpe Plain
No. 6 Becker Vertical
28" Cincinnati, Semi-Automatic
24" Cincinnati Duplex
No. 2 Cinc. Vertical M.D.
No. 3 Cinc. Vertical M.D.
37"x37"x14' Ingersoll Horiz. Slab
Carter & Hakes Lincoln Type
G. & E. Lincoln Type
Owen Duplex
P. & H. Vertical Key Seat
60" Garvin Automatic Duplex

PLANERS:
72" Morton Portable M.D.
42"x42"x13' Pond H.D., Rev. M.D.(2)
42"x42"x12' Cincinnati Rev. M.D. (2)
42"x42"x16' Pond Motor Drive
30"x30"x12' Whitc. Hvy. Duty M.D.
30"x30"x10' Niles 3-Heads

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Brake, Press, Verson 303 all stl.,48"x12ga.MD.
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Planer, 36"x36"x10' Liberty Dbl. Hg. PRT., 2 heads, MD.
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Shear, Sq. U-272 Pexto, 72"x14 ga., AC. mtr.

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LANDIS 20x120" Plain Grinder
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No. 52 Toledo Arch, 29x29 bolster
No. 62 Toledo (2)
No. 63 Michigan, S.S.
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250,000 volt General Electric X-Ray Machine, lead lined, will X-ray boiler plate up to 2" thick, overall dimensions, length 102", width 84", height 88"

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60"x10' New Haven, back geared

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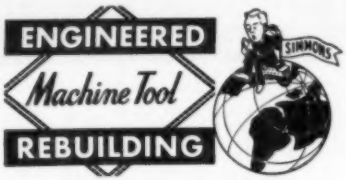

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New Britain, No. 22 & 33
Gridley, Model F, 4 spindle, ⅞, 1¼" & 1¾"
Automatic Threading Lathes, 13"x6' G.H.

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54" Niles, 2 Swivel Heads

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Baush & Natco Multiple spindles

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GEAR HOBBERS, Barber-Colman No. 12

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Norton, 16x36" Crankshaft
Norton, 10x18 & 24" Plain
Cincinnati Face Mill, Excello M.D. spdle.

LATHES, Hendey, 12"x6, 14"x5 & 16"x8'
Hamilton, 16"x6' Cone, Q.C.
National, 18x8' Cone, Q.C.
Schumacher & Boye, 24"x10' Cone, Q.C.
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Acme Turret 3¼x36" M.D.

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Rockford No. 2B Universal Complete, Western Drive & Motor
No. 12 Brown & Sharpe
Briggs Type A & B Mfg.

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No. 62 Bliss Reducing, 6, 8 & 12" stroke
No. 68N Bliss Double Action
No. P 3 &4, PG 2 & 5 Fer., Solid Back
No. 74 & 75 Toledo Open Back
No. 44P Toledo Horning, M.D.
No. 6 & 7A Niagara O.B.I.

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TAPPERS, No. 1, 2 & 2X Garvin
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2" Nat. Acme 4-spdl., Mod.-B
2¼" No. 56 Natl. Acme4-spdl.
No. 24; 33; 34 New Brit. chk.
No. 5A & 6A Potter & Johnston

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136' Chicago Pneumatic, NSB.
136' Ingersoll Rand, ERI.
355' Ingersoll Rand, ERI.
357' Bury
369' Chicago Pneumatic, NSB.
550', National 3-cyl.
620' Sullivan WJ3
676' Ingersoll Rand, XRE2
706' Sullivan, WJ3
868' Chicago Pneumatic, OCB.

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No. 1 Lapointe, screw type
No. 2 Standard screw type broaching press
No. 3 Oilgear hydraulic, m-d.
No. 3 Lapointe of Hud. screw
No. 3 J. N. Lapointe dbl.screw
No. 3 Am. hl. spd., rack type
No. 4 Lapointe of Hud., screw
2 ton American vertical

RADIAL DRILLS

3' Cincinnati
3½'; 4'; 5' Western
5' American, 13" column, full universal, motor on arm
No. 3 Barnes horizontal. Cone or SPD, no tapping

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Stewart triple combination
No. 420 Standard Fuel Engineering Co.
No. 0 Stewart crucible
21"x32"x21" Surface Combustion Co.
45"x46"x45" heating for forge work
No. 515 Standard Fuel Engineering Co.

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26" & 48" B. & S. auto. spur
36"x6" G. & E. auto. spur
Lipe 2 spindle Chamferer
15" Gleason quencher
12HS G & E hobber
Nos. 3 & 12 Barber Colman
Bilton gear miller
Gleason bevel gear tester
Lipe double spdl. chamferer

ENGINE LATHES

14"x6' Walcott
14"x8' Lodge Shipley
16"x6' Lodge & Shipley
16"x6' Monarch, geared hd., motor in base
16"x6' Cincinnati
20"x10' Davis
20"x10' American
24"x10' Schumacher & Boye
24"x10' LeBlond
24"x12' Lodge & Shipley
24"x16' Schumacher Boye
36"x22' Schumacher & Boye

TURRET LATHES

No. 2 SP Garvin
No. 3 Gisholt
Nos. 4, 7 & 9 Foster
No. 4 Bardens & Oliver
No. 4 Cincinnati
No. 6 Warner & Swasey
2½" & 3" Jones & Lamson
21" Gisholt
Nos. 5A & 6A P. & J.
24" Bullard

BORING MILLS

4" Landis floor
36" Niles, car wheel
42" Bullard
52" Gisholt
60" Colburn

MILLERS

No. 1 Cincinnati, plain
No. 2 Rockford, univ.
No. 4 Cincinnati, univ.
Model C Becker, rotary 29¾"
Type AB Becker, vert.
36" Ingersoll rotary
48" Ohio tilted offset
48" Newton rotary
28", 37" & 42" Briggs
No. 1 Davis & Thompson
Type 45 Bilton Productomatic
No. 2 Bilton gear
Kent Owens (Toledo)
2M Potter & Johnston, auto.
Ingersoll hyd. planer type

PLANERS

24"x24"x24" Cincinnati, crank type, one rail head
24"x24"x8' Rockf. one rail hd.
30"x30"x10' Cincinnati, one (or two) rail heads
32"x32"x12' Niles, 1 rail and 1 side head
56"x56"x16' Gray, 2 rail and 2 side heads
54"x42"x12' Gray

PRESSES

750 ton Baldwin Southwark triple act. hyd. toggle draw. 142½" bet. uprs., 84" shut height, 550,000 lbs.
500 ton No. 664B Toledo coing. 40" between uprights
150 ton No. 661 Tol. coin.3"str.
150 ton Elmes hyd.
100 ton French Oil Mchy. Co., hyd. press for strhtng. casts.
108" No. 796¼D Toledo Double Crank Toggle Drawing
No. 30E Cleveland S.S.
28" No. 71 Swaine dble. crk.
No. 21½ Bliss consd. OBI
Waterb. F. OBI 4½" shaft
No. 76 grd. Toledo gap
Fremont gap, 75 tons
Wat. Farrell gap, 40 tons
No. P2 Ferracute
No. EG35 Erie punching
No. 94 Bliss Consd. Punch.
Nos. 55, 55½, and 56 Tol. str.
No. 65 Consd., straight side
No. 7 Rockford, straight side
No. 8-7 ZEH & Hn., strt. side
No. 74½ Bliss, straight side
No. 4 Massillon, str. side, grd.
No. 180 Toledo
No. 78 Toledo
No. 80 Toledo horn
80 ton Jarecki, screw
No. 5A Bliss Stiles, horn
No. 25½ Bliss Consol. horn
No. CA 14 Ferracute, horn
Nos. 13 & 14 Toledo, horn
3, 8 & 20 ton General Flexible
3 ton Fox No. 6

PUNCHES

6" throat 5⅝"x6" Hendley & Whittemore No. 54 punch, rod cutter and shear, with angle shear attach
12" throat, 1¼"x1 Long & Allstatter No. 1½, archit. jaw
12" throat, 1¼x1" Cleveland horizontal, arch. jaw
26" throat, ¾"x¾" Cleveland, architectural jaw

SHAPERS

16", 20" & 24" Walcott
24" Columbia
24" Cincinnati shaper planer
24" Gould & Eberhardt
28" Ohio
36" & 48" Morton draw cut

SHEET METAL

1¼"x1¼"x⅛" Bertsch angle rolls
3/16", No. 1 Gray 34" throat sheet metal cutter
No. 16M Marshalltown serpentine, 16 ga. capacity

THREADERS (BOLT CUTTERS)

½" Acme 2-spindle
½" Webster & Perks 2-spdl.
¾" Land. dbl. sp., Lanco hds.
1", 2", 2½" Landis
1½" Geometric with 1" Murchey die head
1½" Landis 2-spdl., lead scw.
2" Landis 2-spindle, lead scw.
2" Acme

UPSETTERS AND HEADERS

1½" Ajax continuous motion
1½" Acme stop motion
2" National with extended guide and suspended slides
2½" Ajax stop motion. Twin gears, suspended slides
4" Ajax stop motion
4" Ajax stop motion. Twin gears, suspended slides

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MILES MACHINERY CO., SAGINAW, MICH.

EMCO REBUIL

MILLING MACHINES

No. 5 Cincinnati Plain High Power, m.d., rect. overarm, National Standard Spindle —extra heavy type with outer support
No. 4 Cincinnati Plain, m.d., N.S.S., rect overarm, Timken Bearings, very late
No. 4 Cincinnati Universal, m.d., N.S.S., rect overam, Timken Bearings, very late
No. 4-36 Cincinnati Plain Hydromatic, m.d. National Standard Spindle, Timken Bearings, rect overam, very late
No. 3-24 Cincinnati Duplex Hydromatic, m.d., National Stand Spindle, Timken Bearings, rect. overarm, very late
No. 3 Cincinnati Plain, cone
No. 3H LeBlond Plain, cone
No. 13B Brown & Sharpe Plain, s.p.d.
No. 25 Becker Plain, cone
No. 22 Garvin vert., s.p.d.
No. 2 Garvin Lincoln Type, cone
C17 Newton Vertical Slab, m.d.
C66A Newton 3 spindle Continuous, s.p.d.
Carter & Hakes Mfg. Type, cone
No. 7H Becker Lincoln Type, cone
Gooley & Edlund Briggs Type, cone
Putnam Briggs Type, cone
30"x28"x8' Ingersoll Planer Type, m.d.
48" Oesterlein Tilted Offset, m.d., Timken Bearings, N.S.S.

SHAPERS

18" Hollingworth, cone
20", 24" Cincinnati, cone
20" Hendey Friction Type
20", 24" Ohio, cone
20" Steptoe, cone
24" Barker, cone
24" Gould & Eberhardt, cone
24" Gould & Eberhardt, gear box
24" Rockford, cone
24" Rockford, gear box

TURRET LATHES & SCREW MACHINES

No. 3 Cinc. Acme Universal, m.d., chuck.
No. 2L Gisholt, m.d., chucking
26" Libby Type C, m.d., 7½" hole
No. 2 Pratt & Whitney Turret, cone
No. 4 Woods Tilted Turret, cone
1" Briggs Screw Machine, cone
2x24" Jones & Lamson, geared head
3x36" Jones & Lamson, geared head
2 spindle Jones & Lamson Steel Head
21", 24" Gisholt, cone
16" Warner & Swasey, cone

GEARED HEAD ENGINE LATHES

16"x6' Reed-Prentice
18"x8' American, taper
18"x10' American
18"x12' American, taper
18"x15' Lehmann, taper
20"x14' Hendey, taper
24"x16' Axelson, taper
24"x16' Lodge & Shipley Selective, taper
24"x18' Lodge & Shipley Patent Hd., ta
26"x16' Bradford, taper
36"x22' LeBlond
60"x27'6" Niles-Bement-Pond, p.r.t.
60"x30'6" Niles-Bement-Pond
27"x21' Bridgeford, taper

CONE HEAD ENGINE LATHES

14"x6' Carroll
16"x6' Hendey Yoke Head, taper
16"x6' Springfield, taper, relieving
16"x8' Rockford
16"x10' Oliver
18"x8' American
18"x8' Cincinnati
18"x8' Hendey
18"x8' Mueller, taper
18"x8' Springfield
18"x10' Bradford
18"x10' Springfield
18"x12' Monarch
18"x14' LeBlond, taper
19"x8' LeBlond, taper
19"x12' LeBlond, taper
20"x10' Davis
20"x10' Lodge & Shipley
21"x8' LeBlond, taper
21"x10' LeBlond
21"x16' LeBlond, taper
22"x8' Lodge & Shipley, taper
22"x13' Niles
24"x8'6" Bridgeford
24"x10' Bridgeford
24"x10' LeBlond
24"x11' Chard
24"x16' Schumacher-Boye
24-48"x16' McCabe 2in 1
24"x26' American, taper
26"x18' Schumacher-Boye, taper
27" raised to 38"x16' American, taper
36"x10' Schumacher-Boye
42"x24' Springfield

GRINDERS

6x32" Norton, m.d., (3)
10x18" Brown & Sharpe Plain Cyl., belt
10x24" Landis Plain, m.d.
10x30" Queen City Plain, m.d.
10x50" Norton Plain, m.d.
10x36" Norton Plain, m.d. (6)
12x18" Cincinnati Plunge Cut, m.d.
12x36" Cincinnati, m.d.
12x36" Modern, m.d.
12x42" Landis, belt
12x48" Modern, m.d.
12x72" Cincinnati, m.d., hydraulic fd., la
12x48" Modern Universal, belt
No. 6 Bryant Chucking, belt
No. 70 Heald Internal, belt
No. 1 Fraser Lapper, belt
No. 3 Brown & Sharpe Planer Type, belt
No. 3 Diamond Surface, belt
No. 255 Heald Rotary, belt

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1001 TENNESSEE AVENUE,

MACHINE TOOLS

Walker Single Stroke, Surface, belt
18x48" Diamond L.D. Face, m.d.
30x84" Diamond H.D. Face, m.d.
54" Bridgeport Knife, belt
60" Bridgeport Face, m.d.
Covell-Hanchett Knife, m.d. 102" cap.
Cincinnati Valve Seat Grinder, m.d.
No. 1 Cinc. Univ. Tool & Cutter, belt
No. 2 Oesterlein Univ. Tool & Cutter, belt
No. 3 B. & S. Univ. Cutter & Reamer, belt
No. 41, 4, 5 Oliver Drill Pointers, m.d.
No. 23 B. & S. Gear Cutter Grinder, belt
Gisholt Universal Tool, belt
Gleason Cutter Grinder, belt
Gould & Ebt. Gear Cutter Grinder, belt
Landis Chaser Grinder, s.p.d.
Yankee Drill Grinder, belt
U.S. Elec. Tool Polishing Stand, m.d.
Mitchell Type A1 Polishing Stand, m.d.
Springfield Wet Emery Grinder, m.d.
No. 1 Gardner Disc, m.d.
No. 4 Gardner Disc, belt
No. 6 Gardner Disc, m.d.
No. 20 Gardner Comb. Disc & Roll Sander
No. 51 Besly Disc, m.d.
No. 120 Gardner Combination Disc, belt

HAMMERS

60 lb. Bradley Rubber Cush. Helve, belt
100 lb. Bates, m.d.
100 lb. Little Giant, belt
200 lb. Bradley Upright Strap, belt
350 lb. Little Giant, belt
350 lb. N.-B.-P. Steam, brand new (4)
550 lb. Bement-Miles Single Frame
650 lb. American Eng. Wks. Steam
800 lb. Erie Single Frame Forging, steam
1500 lb. Morgan Eng. Single Frame Steam
2000 lb. Erie Double Frame Steam Forging
2000 lb. Niles-Bement-Pond Single Frame Steam

PIPE MACHINES

12" Landis, m.d.
No. 2 Bignall & Keeler, 2" cap., m.d.
2" No. 70 Jarecki, m.d.
2" Landis Double Head Pipe & Nipple, md.
2" Merrell, m.d.
2" Saunders, m.d.
4" Bignall & Keeler, m.d.
4" Eaton, Cole & Burnham, belt
8" Bignall & Keeler, belt
8" Landis, m.d.

BOLT THREADING MACHINES

9/16" Landis, 2 spindle, m.d.
1" Acme, 2 spindle, cone
1" Acme, 3 spindle, cone
1¼" Landis, 2 spindle, m.d.
1½" Landis, cone
1½" Acme, 2 spindle, m.d.
2" Landis, m.d.
No. 11S Rickert & Sh. Auto. Thread. 1" cap.
American Bolt Heading Machine, 1¼" cap.

BORING MILLS

30" Bullard, cone, 1 head
42" Gisholt, m.d., 2 heads
48" Niles Car Wheel Borer, cone
51" Baush, m.d., 2 heads
7' Niles, cone, 2 heads
7' ext. to 10' Niles, m.d., qd. fds., 2 hds.
No. 2 Barrett Cylinder Borer, belt
No. 4 Niles-B.-P. Horizontal 5½" bar, m.d.
N.-B.-P. Cyl. Borer, md., 12" main bar

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2½' Avey Sensitive
3' American Sensitive
3' Carlton Sensitive
4' Hammond Jack Knife
4' Niles-Bement-Pond Semi-Univ., gear box
4' Ryerson Plain, gear box, m.d.
5' American Triple Geared, gear box
5' Bickford Plain, d.c. drive
5' Dreses Plain, gear box, m.d.
5' Niles-Bement-Pond Semi-Universal, m.d.
5' Prentice Plain, cone
6' Dreses Plain, m.d.
6' Niles-Bement-Pond Semi-Universal, m.d.
7' Dreses Plain, gear box
7' Fosdick Plain, cone

PLANERS

24" Cincinnati Crank, 1 head, m.d.
28"x28"x8' American, 1 head, belt
28"x28"x8 G. A. Gray, 1 head, belt
30"x30"x6' G. A. Gray, 1 head, belt
30"x30"x10' American, head, belt
30"x30"x10' Cincinnati, 2 heads, belt
32"x32"x8' Gray, 1 head, belt
34"x24'x8' Cincinnati, 1 head, belt
36"x36'x10' Cincinnati, 3 heads, belt
36"x36"x10' Whitcomb-Blaisdell, 2 hds., b.
36"x36"x13' N.-B.-P., 1 rail, 1 side hd., belt
42"x42"x16' Rock., varble. spd. md.,4 hds.
42"x42"x20' Ohio, m.d., 2 heads
60"x48"x16' Niles-Bement-Pond, m.d., 3 hds.

GEAR CUTTERS AND HOBBERS

6", 18" Gleason Straight Bevel Generators
16" Cincinnati Gear Hobber, m.d.
No. 1 Lees-Bradner Production Gear Hob.
No. 3-26", 3-36" Brown & Sharpe Gear Cut.
No. 3-26" Cincinnati Gear Cutter
No. 3H Brown & Sharpe Gear Cutter
No. 5A Lees-Bradner Gear Generator
No. 6-60" and 6-72" Brown & Sharpe
Cross Gear Tooth Rounder
Gleason Spiral Bevel Gear Rougher, s.p.d.
Gleason Bevel Gear Tester, belt
20" Rochester Gear Tooth Rounder
Schuchardt & Schutte Gear Tooth Rounder
D. E. Whiton No. 1-26" Full Universal Spur & Bevel Gear Cutter, old type

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12"x5' Sebastian Geared Head
Niles Axle Lathe, cone

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CINCINNATI, OHIO

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3" Bar, Floor type-cross tbl.
4" Bar, Niles, Table type
5" Bar, Beaman-Smith, Hor.
52" Rodgers Vertical 1 head

HOBBERS & GENER'S.
6" & 11" Gleason bevel gear
26" Rhenania & No. 3 Adams

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3½x60 Fitchb.; Lo-Sw. S.P.D.
9x20 Porter-Cable-Prod.
14x6 Flather Q.C.G. Tap. Att.
24x8 Sch-Boye, Q.C.G. T.A.
27x16' Bridgeford—cone

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No. 3 Cincinnati, Univ., C. Hendey, Lincoln Type. Prod.

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24" Walcott, Helical Gear
24" Ohio, B.G. Single P.D.

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No. 9 Foster—3¼" Bar Cap.
2A W. & S., Cone Dr.

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Broaches: V18 Amer.
1 & 2 Spindle LaPointe
Drills: 20" to 25" Barnes, B.G. Tap. Att.; 14 sp. Pratt & Whitney Multiple
Radial Drills: 3' Bickford
No. 6 Wells wire st. & cut.
Grinders: 18" to 30" Disc. 6", Heald, Rotary Surface
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20" Lever, Wheel & Lever and Power Feed.
24" and 28" sliding head, back gear, power feed.
Bausch Multiple 16 spindle No. 1 Morse Taper.
4 spindle Foote-Burt, heavy duty.
6 spindle Hole Hog No. 1 Morse Taper, power fd.
1, 2 and 4 spindle high speed 8' overhang.
5' Bausch Radial Drill.
59 other drills of various sizes and types.

MISCELLANEOUS
Brake, Robinson, toggle, 5'.
Brakes, 6' and 10' for 18 gauge.
Grinders, cutter and cylindrical, plain and univ.
Grinders, Bryant deep hole chucking.
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Lathes, 20"x10' Bradford, 3 step, db. bk. gr.
Lathe, 28"x20', 6' Rahn Carpenter, with rais. blocks.
Milling Machine, No. 4 Burke.
Milling Machine, 20"x20"x8' Ingersoll Slab, m. d.
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Shaper, 24" G. & E. back geared crank.
Turret Lathe, No. 4 Bardons & Oliver, chuck. equip.
Turret Lathe, 2¼" J. & L., cross slide head.
MOTORS, REBUILT 3 Phase ½ to 50 HP various speeds.

This is only a partial list of our large stock, which is constantly changing. Write for what you need

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5—Four Spindle Model M, ⅞" Cleveland Automatic Screw Machines Arranged for Motor Drive

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1—Single Spindle 1½" Model B. Cleveland Automatic

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SURPLUS MACHINE TOOLS FOR SALE

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Includes chuck face plate and steady rests

20x 8	L & S	QCG	MD
24x14	L & S	QCG	MD
20x 8	Hendy	QCG	TA
18x 8	Sidney	QCG	TA
14x 6	Willard	Semi	QCG
20x12	Draper	TA	

SHAPERS
24" Cincinnati Back geared
16" Gould & Eberhardt back geared

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LeBlond No. 4 Heavy Duty Universal
Detrick & Harvey Horizontal 3½" bar

GRINDERS
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PLANER
Lodge & Davis 24" ext. to 36"

HAMMER
Bradley 100 lb. Compact

Full description mailed on request. May be inspected at our plant. Bids must be accompanied by certified check for 10% of bid. Bids will close June 14th, 1941. We reserve the right to reject any or all bids.

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There's a matter of CONDITION to reckon with—

UNUSUAL in condition—and UNDER "the usual" in price.

MILLING MACHINE, Vertical No.3, "Cincinnati"; geared head; single pulley drive.
MILLING MACHINE, Universal, "Brown & Sharpe", No. 4; universal head and tailstock; c-shaft
MILLING MACHINE, Plain, "Cincinnati", No. 2; vertical attachment; c-shaft
MILLING MACHINE, Planer-type; 42"x42"x8'; "Bement-Miles", four heads
GEAR PLANER, 16' cap'y.; spur gears, external and internal, "Gleason", Automatic, arranged for motor drive
GEAR CUTTER, 36" diam. spur gears; "Gould & Eberhardt"; arranged for motor drive
LATHE, 42" swing, 20' bed, heavy, "Niles", triple geared
LATHE, 42" swing, for car wheels, "Niles-Bement-Pond", double head, m-d.
LATHE, 42" swing, for banding or armature turning, "Peerless"
LATHE, 38-60" swing, Sliding Bed, Gap Lathe, "Harrington"
LATHE, 60" swing, "New Haven", 20' bed, triple geared
HORIZONTAL CYLINDER BORER, 12" diam. bar, "Niles", motor drive
HORIZONTAL CYLINDER BORER, 5" diam. bar, "Barrett", motor drive
PIPE MACHINE, 6" cap'y., "Jarecki", motor drive
PIPE MACHINE, 10" cap'y., "Standard", motor drive
FORGING PRESS, Steam Hydraulic, 500-tons cap'y., "United Engineering & Fdy. Co."
FLANGING PRESS, 450-ton, "R. D. Wood Company's"
BOLT THREADER, 2" cap'y., "National"
BULLDOZER, "Ajax", No. 8, motor driven
BULLDOZER, "Williams & White", No. 9, motor drive
PUNCH & SHEAR, 60" throat, "Hilles & Jones", single end; interchangeable
PUNCH & SHEAR, 54" throat, "Southwark", single end; interchangeable
PUNCH & SHEAR, 25" throat. "Beatty"; single end; interchangeable
PUNCH & SHEAR, 15" throat, "Williams & White", No. 14
PUNCH & SHEAR, 15" throat, "Beatty". Two machines available. Single end; interchangeable
UPSETTING & FORGING MACHINES, 4" "National," also 4" "Ajax"
UPSETTING & FORGING MACHINES, 2" "Acme", also 1½"
STEAM HAMMERS, 1100-lbs. and 250-lbs., Single Frame; steam or air
ACCUMULATOR, "Southwark" Hydraulic, ram 15" diam., 15' long
LOCOMOTIVE CRANE, "American", 12½-tons at 12' radius; oil fired boiler
NEW—THREADING MACHINES, "Modern" cap'y. ¼" to ¾" straight thread, and ⅛" to ⅜" pipe thread; quick change; max. length thread 7¾"; hole thru spindle 13/16"; 9 available, (4) single spindle and (5) double spindle; belt or motor driven

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One—Shows entire Equipment in St. Paul, Minn. plant, Structural, Forging and Woodworking Shops. Another—covers all sizes of Lathes, Planers, Boring Machines, Horiz. and Vertical, Milling Machines, Radial Drills, Turret Lathes, Gear Cutters, Keyseaters, Shapers, Slotters, Bolt Machinery, Cranes, etc.

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(REG. U. S. PATENT OFFICE)

50 Church St., New York

WANTED

4 Planers 36" to 90" wide and 10' to 25' long, Also Openside Planers
3 Vertical Boring Mills, 24" to 42" with side head
3 Vertical Boring Mills, 42" to 72" and 90", two heads on rail
4 Gear Cutters from 18" to 96"
7 Lathes from 24" to 48" swing and 7' to 24' between centers
1 Turret lathe 3" spindle hole
5 Millers, Horizontal and vertical from No. 2 to No. 5
2 Millers, Planer type with 2 or 3 heads 30" to 60" wide, course of table without importance
3 Radial Drills 3', 4' and 6'

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Good Lathes — Good Values

40" 20' Houston Stanwood & Gamble Triple Gear, Q.C.G. with Taper Attach. & Equip.
28"x20' Schumacher-Boye, D.B.G., Q.C.G., with Taper Attach. and Equipment
26" 22' Davis, D.B.G., with Taper Attachment and Equipment
21"x12' LeBlond, Geared Head, H.D., Q.C.G., M.D., with Taper Attach. & Equip.
18"x10' Reed-Prentice, Geared Head, Q.C.G. with Taper Attachment and Equip.
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Fully equipped; operating; general machine-tool-die some defense work; new bldg. 6000 sq. ft.; large lot; est 18 yrs.; health compels sale.

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Gear generators, Bilgram bevel, 6" & 16", guaranteed to be in A-1 condition with all change gears and segments.

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AUTOMATIC SCREW MACHS.
Cleveland, ½", 1¼", 1½", 2" & 2¾"; No. 1, 2, 3 Manville

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12/18' Betts Extension type with motors; 72", 24" Bullard; 30", 60", 72" Colburn rapid traverse vert.; 50" Bullard, 2 heads; 42", 52" Niles

BORING MILLS—HORIZ.
12" Niles Cyl. Dble. End
7" Bar Putnam-table type; 2½" Cleve. No. 0 G. & L. 3"

BRAKES, CHGO. STEEL
Hand—3'16, 4'12, 4'16, 6'16, 6'18, 8'16, 8'14, 10'14, 10' 16
Pwr. Apron—10' ¼"—10'3/16" —10' 10 ga.—8'12—6' 10

IRONWORKERS, UNIVERSAL
No. 13 & 20; Pels; Oek. 6x6x⅜ No. 4 Ryerson Notching Attach. Smith No. 91-16, notching att.

BOARD DROP HAMMERS
1200 lbs. B.&S.; 800 lb. W.&W. 800 lbs. and 1000 lbs. Bliss

LATHES
Geared Head Lathes; 16"x8 Ft., Monarch 20"x12 Ft. 22x4½ x14 Ft. McCabe Dble. Spindle Bridgeford 20" x 9 ft. and 32"x16 Ft. G.H. 15 speeds 16"x6 ft. Hendey-Yoke Hd. 15" 8 Ft. Sebastian Motor in base 20" x 10 & 22 x 12 Ft. L & S.; 20x15' Lehman G. H. Bradford 26" x 10'; 24" x 12' 36x14' Springfield; 36x16' S & B; 52x22' Flf.; 18x36x7' Put. Am. Grd. Hd. 18x8 No. 9 LeBlond Multi-cut.; 16x8 Bradford; 30x18, L & S 18"x10' Grd. Hd. M.D. 30' Pit Lathe 20x12 Ft. Monarch Gap Lathe 22"x16' Hamilton. gd. hd.

LATHES—TURRET
W. & S.—No. 4A & 4, No. 2 & 2-A, No. 6; No. 2-B Foster; No. 4 B. & O.; 28" &24" Gish.; 28" Pond; 22" LibbyU.

EXCEPTIONAL TOOLS
Grinder — Centerless — No. 2 Cincinnati
Grinder, Surface; No. 16 Blanchard
Grinder—Cyl. No. 25 Landis 12"x144"
Plate Planer — 20 Ft. Niles
Power Press Brake or Gang Punch—12' Long & Allstatter
Threader, Bolt, 12" Landis, M.D. Late type quick acting die head

MILLERS
UNIV. No. 3 B. & S.; No. 3 & No. 4 Cinc.; No. 2 Kemps.; No. 4 Becker; No. 3-GH Hendey; No. 1½ LeBlond; No. 2 Cleveland; No. 2 Garvin; No. 38 Cincinnati motor-in-base VERT.—No. 5, 6 & 5-C Becker PLAIN No. 1 & No. 1½B, No. 2-B & 3-B K & T; No. 3 CIN. B. & S. No. 2-B; No. 4 & No. 5 LeBlond, S.P.D.

PLANERS
8'x8'x25' Pond Planer 101" bet. housings 2 heads on rail, 2 side heads mtr-dr.

36x36x10 Ft. American
30"x30"x6' Gray
26x8 openside Cincinnati
26x6' & 26x8' Cleve. Openside
60x60x18 Ft. Pond
36x36x14 Ft. Det. & H. with side hd.; 36x36x8 Ft. Niles

PRESSES, HORN
Bliss Nos. 40, 21, Toledo Nos. 14, 42, 41H, 43B; Adriance No. 22 & No. 24; No. 10-1 Minster

PRESSES, O.B.I.
Nos. 1—4, Bliss; No. 5 Mich. No. 4 V & O—7" stroke; M.D. 6-No. 31-C McDonald Auto. Strip Feed Dble. Action

PRESSES; DOUBLE CRANK TOGGLE
No. 400 Bliss; 108" bet. housings; bed 60x108"; tie rod; with air cushions; str. of plunger 31"; wgt. 215,000

PRESSES, Double Crank
Clearing Crankless 4-Point Suspension Type Triple Action Press—All Steel Frame Construction—Self Contained Motor Drive—All Gears Enclosed, 84"x133" bed; Stroke of plunger 28"

Hamilton, No. 6010¼—tie rod 101½" shaft
(1) No. 6-D Bliss 12" strk.; 36"x60" bed Air Cush.
No. 94-G Toledo 8" stroke, 42"x84" bed; Air Cush.
No. 158-B Cleveland 11" shaft; 72" betw. housgs.
No. 4¾ Bliss; No. 10 Wells
No. 154-F Cleveland, 6" shaft—Bed 50"x72"
No. 23—J Bliss Gap Frame —6" str. 4" shaft
No. 206-B Toledo Gap Fr. —6" str. 48" betw.
No. 206F Toledo, gap frame, bed 102"

PRESSES, Toggle
Bliss Nos. 5, No. 4-A—99% new; 1½; 69N. Toledo No. 164 & 165 No. 99 Stoll

PRESSES, Straight Side
No. 56 Bliss Consolidated
No. 4019 Hamilton 800 ton
Bliss, No. 78½, 24" stroke
No. 73½ & No. 3½A Bliss
Toledo—No. 55, No. 57
2-No. 65 Consolidated
No. 6 Walsh & No. 5 Massillon

RADIAL DRILLS
American 4', 5'; 6' Western; 5 & 6 Ft. Fosdick; No. 2 Bick.; 5' Fosdick

ROLLS
Wickes, Pyramid Type, with mtr., Drop End—18"x1"
12"x1¼" Wickes
10 Ft. Wickes Vert. 1¼" cap.
10 Ft. Initial type ¾" capacity
10 Ft. Pyr. type 12", top, 9" bottom rolls; 6x6x½ Power Angle

ROLLER DIE MACHINES
2, 4, 5, 7, 8 Spindle

NEWBOLD PLATE LEVELLER AND STRAIGHTENER
96" wide; 13 rolls and 2 pinch. Motor drive with 75 H.P. A.C. motor

ROLLER LEVELLERS
McKay 60"-66"-54"-72"

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Band—No. 8 Marvel
Friction—No. 0, 1, 2, 3, 4
Hack—6x6, 9x9, & 13x16 Peerless; 8"x8" Atkins Kwik-Kut

ALLIANCE BENDING ROLLS
1—20 Ft. Long Dia. top roll 24"—lower rolls 18" each—Drop end housing — hydraulically controlled—motor drive —Est. weight 420,000 lbs.

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30' Birdsboro Hydraulic Power Press Brake or Forming Press; Capacity approx. ½" plate
Ohl—10' 5/16"—10' 14 ga. 8' 10 ga.—New 8L 10 Chgo. Stl. Ohl 10' 10 ga.; Clearing 10' ¼"; No. 355 Chgo. Steel Poorman 10'x10 ga.; New No. 1062, 2062, & 2078 Verson All Steel Juniors

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G. & E. Hi Duty, 28", 24"; 24" American & Queen City 16" & 28" Rockford; 24" American & Queen City; 25" Smith & Mills

SHEARS POWER
16 Ft. Tol. ¼" cap. 18" gap

126" United Eng., 7 ga.
10 Ft. 3/16", 11 Ft. 16 gauge
12'16; 12'14; 10'10; 10'14; 10' 18; 6'18; 8'16; 36"x3/16" 8'14; 6'5/16"; 6'14; 52"14; 48"x14
Alligator No. 1¼ Doelger & Kirs.
Rotary No. 5 Quickwork ¼" cap. No. 3—3/16" cap. 36" throat
Marshalltown. ¾" cap. 48" thr. M.D.

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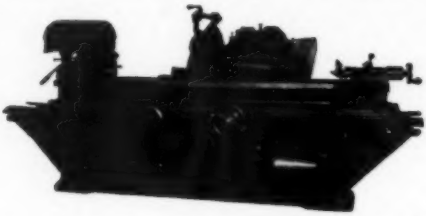

6"x32"	10"x72"	16"x72"
10"x18"	14"x36"	16"x120"
10"x24"	14"x50"	18"-24"x96"
10"x36"	14"x72"	18"x96"
10"x50"	16"x50"	21"x96"

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645 WASHINGTON BLVD. CHICAGO

For Immediate Delivery

LATHES

Monarch 20"x10' Geared Hd., M.D. in base
LeBlond 19"x38"x10', Geared Head, M.D. Sliding bed
American, 24"x10', Q.C., M.D., Standard Equipment
American, 20"x8', Q.C., D.B.G.
LeBlond, 20"x10', Q.C.
Hendy, 16"x10', M.D.
12, 14, 16" LeBlond, Amer., Monarch, Mulliner, Lodge & Shipley and many others —4 are geared heads

GRINDERS

12x42 Landis
No. 2 Van Norman
No. 3 Bath Universal
No. 3 Wilmarth & Norman Surface Grdr.
No. 60 Heald

BORING MILLS

36" Bullard
60" Rogers, M.D.

MILLERS

No. 3 Cinc. Plain
No. 4 Cinc. Universal Vert. & Dividing Hds.
No. 15 Garvin 12"x62" Table
No. 1 Grand Rapids B.G. M.D. With Heads
No. 5 Becker Vertical
No. 6 Oesterlein 24x7½x18" B.G. M.D.

SHAPERS

Stockbridge With Universal Milling Mach. head—14x70 S.P., Gear Box
12"—14"—16"—18" & 24" Shapers of various makes

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WE OFFER:

No. 33 New Britain Automatic

2 Spdl. L&G Hyd. Cycle Drill

4 Spdl. Avey Sens. Drill

6 Spdl. L&G Sens. Drill

Sgl. Spdl. Cinc. Bickford Drill

Sgl. Spdl. Avey Drill

4 Spdl. L&G Drill

No. 6 Besly Dbl. Opposed Disc Grinder

9"x20" Porter Cable Hi-Speed Mfg. Lathes (4)

14"x8' Seneca Falls Lathe Motor Drive with motor

20"x10' Schumacher Boye

16"x8' Reed Prentice Lathe

3¼"x36" No. 3 Cincinnati Acme Turret Lathe

Bilton No. 8 Productoma. Mill

Bilton No. 50 Productoma. Mill

Bilton No. 40 Productoma. Mill

No. 15 G Automatic Gear Mill.

No. 1 Garvin Tapper

Webster & Perk Tapper

⅜" Hubbell Horiz. Tapper

Bethel Player No. 1U Lapper

W. F. Frazer 20" Lapper

No. 8E—108, BLISS PRESS, Straight Side, Double Crank, Dbl. Back Geared, Twin Drive, Tie-Rod, Friction Clutch. Strke—8". Shut height-28". Equipped with Marquette Air Cushions.

7½B Bliss Press. Straight Side, Dbl. Crank, Dbl. back geared, Twin drive. 40"x60". Stroke-13". Shut height-18".

42"x42"x10' Detrick & Harvey Open Side Planer. 2 rail heads, 1 side head.

Hanchett Traveling Wheel Grinder, Type UK, Class 500. Capacity-150".

6" x 10" x 36" Norton Openside Grinder Magnetic Chuck, water filter, motor.

10"x18" Norton External Grinder

BROWN & SHARPE AUTOMATICS

4—No. 00G B. & S. Auto.
2—No. 00 B. & S. Auto.
6—No. 2 B. & S. Auto.
3—No. 00 B. & S. Turret Formers
2—No. 0 B. & S. Turret Formers
1—No. 0 B. & S. Cut-Off.

No. 748 Niagara Squaring Shears with hold-down back screw ga.

No. 55 Acme Automatic, 4 spindle, 1⅜".

No. 53 Acme Automatic, 4 spindle, ⅞".

12" Pratt & Whitney Sur. Grdrs.

18"x14' American Back Geared Lathe Complete with NEW Western Drive, and Motor.

30"x30"x10' Whitcomb Planer, 2 rail heads.

24"x24"x8' Whitcomb Planer, 1 rail head.

Send us your inquiries.

Quickwork 36" Sheet Mtl. Dbl. Bumping Hammer (2)

Dings Mag. Chip Separator

Lipe 2 Spdl. Chamferer

20 Ton Hanna Yoke Type Rivt.

Hutto 2 Spdl. Honing Machine

No. 7 B & O Screw Machine

No. 4 B & O Hd. Screw Machine (4)

No. 2 Pratt & Whitney Hand Screw Machine

Oeking Combination Punch & Shear

Pettingell No. 14 Sheet Metal Rotary Shear (2)

Buffalo Armor Plate Bar Cutter

No. 2 Ryerson Lennox Throatless Bevel Shear

13" Pratt & Whitney Single Spindle Profiler

3"x36" J & L Turret Lathe

3¼"x60" Lo-Swing Lathe

Lynd Farquhar 26" OS Combination Crk. Pl. and Shaper

8" Heald Rotary Surf. Grinder

Dalton Lathe

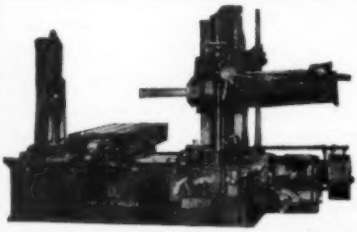
LAFAYETTE MACHINERY CORP.

6320 E. Lafayette **Fitzroy 7745, 7746, 7747** **Detroit. Mich.**

MOSER'S HIGH GRADE TOOLS

No. 3-B K.&T. Pl. Milling Mch., Vert. Hd.
4"x36" J.&L. Steel Hd. Tur. Lathe, equip. completely for bar and chuck work, collets and 3 and 4 Jaw chucks, mtr. dr.
No. 2 Foster Screw Mch., A.C.&B.F.
3" Oliver Drill Grinder, motor in base
Oliver Arc Face Mill Grinder, 24" cap.
12"x6' American Q.C.G. Lathe, D.B.G., collets, chucks, taper attachment
14"x8' Davis Q.C.G. Lathe, ctrshaft M.D.
16"x6' Reed P.C.G. Lathe
20"x12' Hendey Q.C.G. Lathe, taper att., pan bed, M.D.
24"x12' Walcott Q.C.G., D.B.G. Lathe
Pratt & Whitney Hand Miller
No. 3 Adams Gear Hobber
2—No. 2 Avey Single Spindle Drills
No. 2 Leland-Gif. Sql. Spindle Drill
No. 2-A High Speed Rivet. Hammer, M.D.
No. 130 Pexto Foot Op. Squar. Shear
No. 24 New Britain 5-Station Automatic with chucks, B.D.
32-Spindle Natco Drill
Dbl. End Rockf. Horiz. Bor. & Drill. Mch.
Dbl. End W. F. & John Barnes Drilling Mch.

MOSER MACHINE TOOL SALES — 1608 W. Clybourn St., Milwaukee, Wis.



IN STOCK

No. 0 Giddings & Lewis, horizontal Boring Bar, motor driven, with 30"x54" table, length of bed 85", with 17 cutters, 4 arbors.

LAKE MACHINERY CO.
652 W. Lake St., Chicago, Ill.

FOR SALE

8	1-¼ Model A Cleveland Automatics, Motor Driven with 220 volt, 60 cycle, 3 phase motors. Machines in excellent condition.
3	No. 12 Brown and Sharpe Production Milling Machines with Rapid Traverse, Motor Driven with 220 volt, 60 cycle, 3 phase motors. Excellent condition.
3	No. 00 Brown and Sharpe Automatic Cut-Off Machines with Overhead Stop. Excellent condition.

SUPERIOR STEEL PRODUCTS CO., INC.
Cleveland & Mound Sts., Muncie, Ind.

GET IMMEDIATE DELIVERY. SAVE MONEY
on Screw Machine and Automatic Tools

Just Received 10,000 Recessing and Floating Holders, Box Tools, Collets and Posts for Cleveland, B. & S., B. & O. and Warner & Swasey Automatics and Screw Machines. For Working Stock from 1" to 8".

Over 150 Die Heads and Collapsible Taps. No Lists Available. We Suggest You Send Your Man To Select On The Spot. Priced Right.

DE WITT TOOL CO., Inc.
248 CENTRAL AVENUE NEWARK, N. J.

COME AND SEE DETROIT'S FINEST REBUILDING SHOP

Had to acquire 6000 feet more, Modern, single story Building devoted entirely to Rebuilding and Modernizing our own and Customers' Machines.

If you have machine tools you would like rebuilt, a phone call or wire will bring our representative to your plant to give an estimate.

SEE THESE MACHINES IN OUR WAREHOUSE

AUTOMATICS
4-⅝" Gridley, single spindle
Hayden ¾" 5-spindle
⅞" Model B Cleveland (2)

DRILLS
Allen 6-spindle 14" M.D.
24" Sibley & Ware
4-spindle Reed
4-spindle Woodward & Roq.
No. 33 Radial, bench model
10" Excelsior
20" Barnes
20" Superior
½" Commander Electric
½" Utility, Electric
20" Silver
24" Aurora
14" Meyers
14" Barnes
Natco Minister, Multiple
24" Sibley, single spindle
3' Carlton Radial (2) sensitive
3' American Radial (2) sens.
Weigle Vertical 1 spindle (3)
No. 2 Foote-Burt Rail 6-spdl.
Bausch Multiple, 8-spindle

GRINDERS
6x32 Norton Plain
No. 2 Modern Univ. 12"x24"
No. 2 Cincinnati Plain
No. 2 Brown & Sharpe Surf.
No. 1 Landis Universal
10"x36" Norton Plain Cyl.

LATHES
58"x22' Fitchburg
12"x4 American 47AP Bench
14" Hamilton LCG
26"x10' Bridgeford
12"x5' Sheldon (new)
14"x5' LeBlond Production (2)
14"x6' American, mtr. in base
14"x6' Lodge & Shipley QCG
14"x7' Davis, QCG MD.
16"x6' Monarch QCG MD.
17"x6' Sidney MD.
18"x8' Lodge & Shipley
18"x8' Walcott
5"x5' Fitchburg LoSwing (4)
20"x10' Lodge & Shipley
No. 6 LeBlond Multi. Cut (4)
16"x6' Rockford Plain (2)
16"x6' LeBlond
16"x8' Hendey

MILLING MACHINES
No. 2 Kempsmith Universal
No. 1 Kempsmith Universal
No. 4B Becker Vertical
Oesterlein Plain (2)
Ingersoll Slab

SHAPERS
8" Shape Rite (new)
20" Davis MD.
20" Gould & Eberhardt
20" Kelly MD.
20" Stockbridge

PLANERS
Ohio 24x24x6
4" Wallace, bench

TURRET LATHES
No. 6 Brown & Sharpe
21" Gisholt
24" Gisholt
No. 4½ Bardons & Oliver

MISCELLANEOUS
Garvin Cam Cutters
8" Gleason Bevel Gear Generators (2)
24"x8" G&E Gear & Bevel Cut.
No. 3 LaPointe Broach (2)
Combination Woodworking Machine
Vertical Heads
Dividing Heads
No. 101 Niagara Punch Press
No. PG5 Ferracute Press
Famco Presses (new)
Rousselle's (new)
No. 63 Consolidated
Toledo Hack Saw
6x6 Racine Hack Saw
Klemm Metal Cutting Saw MD
Doty Bar Shear

BRADLEY MACHINERY COMPANY
Detroit, Michigan

Main Office and Warehouse
211 Jos. Campau

Rebuilding Plant
1155 Bellevue

READY TO WORK

BRIDGEFORD CENTER DRIVE AXLE
(Will take up to 12' x 8' Axles)

48' MESTA SLIDING FRAME COLD SAW (Friction Type)
GLEASON LATHE 48' swing, 13' bed, BD.
BARRETT HORIZONTAL BORING MILL, 5' bar, BD.

KAMIS ENGINEERING CO.
302 Moore Street **Howard 8474** **Phila., Pa.**

FOR SALE

No. 56 National Acme 2¼" capacity 4-spindle Automatic Screw Machine, Serial No. 7018, with large amount of extra equipment.

Excellent operating condition.

This machine is reasonably priced for quick sale. Only one available; subject to prior sale.

THE BRIGHTON SCREW & MFG. CO.
1456 HARRISON AVENUE **CINCINNATI, OHIO**

LATHES
27"x14' Lodge & Shipley
24"x12' Boye & Emmes
20"x10' Boye & Emmes
18"x12' Hendey
16"x8' Lodge & Shipley
15"x6' South Bend

TURRET LATHES
1" Dreses Wire Feed
2 5/16" Foster Wire Feed
20" Swing P. & W. Geared Head

MILLING MACHINES
2—No. 1½ Rockford Plain
No. 1 B. & S. Universal

SHAPERS
16" Cincinnati
20" Steptoe

DRILLS
3' Cincinnati Bickford Rad.
Barnes Hor. Drilling & Boring Machine
Binsee Hor. Drilling & Boring Machine

MISCELLANEOUS
No. 0 Buffalo Angle Bending Roll
15 Ton Lucas Forc. Press

McBRIDE & McCLENNEN *Since 1919*
Trading As
DELTA EQUIPMENT CO. **148 N. Third St., Philadelphia, Pa.**

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LARGEST STOCK IN THE U.S.A.
Prompt Shipment — Send Us Your Inquiries
Largest and most selective variety of makes, sizes, and types for all requirements for moving air.
Our Engineers will be glad to help you, upon request, without obligation.
Write for Our Latest Stock List

General Blower Co., **407 N. PEORIA ST. Phone MONroe 0244** **Chicago, Ill.**

BORING MILL, 36" Baush, motor drive
GRINDER, 20"x144" Landis Plain, mtr. dr.
GRINDER, 12"x36" Pratt & Whitney, belt dr.
GRINDER, No. 33 Abrasive, surf., mtr. dr.
LATHE 60"x16' L. & S., 18 spd. grd. head
LATHE, 54"x16' Johnson, motor drive
LATHE, 36"x23' Bridgef., 15 speed grd. hd.
LATHE, 30"x20' LeBlond, motorized, q.c.
LATHE, 19"x8' Sidney, motorized
LATHE, 18"x10' American, grd. hd., q.c.
TURRET, No. 6A Potter & Johnson, mtr. dr. chuck.
HAMMER, 1100 lb. NBP Steam Forging
HAMMER, 2000 lb. Chambersb. Steam Forg.
KEYSEATERS, No. 0 & No. 5 Mitts & Merrill
PLANER, 48"x60"x14' D.&H. Opens., b. d.
PLANER, 36"x36"x10' Woodward Powell, 4 hds., b. dr.
MILLER, No. 4A Brown & Sharpe Univ. mtr. dr. table 18"x64", req. equip.
MILLER, SD Becker continuous, 40" dia. tbl.
PIPE MCH., 2½ to 8" Will. Rapiduc., m.d.
SHAPER, 24" Cincinnati, belt drive
WHEEL PRESS, 200 ton Caldwell Hydraulic, 48" between bars

THE O'BRIEN MACHINERY CO., 113 N. Third St., PHILADELPHIA, PA.

AUTOMATICS

2¼" Gridley Single Spindle
3¼" Gridley Single Spindle
4¼" Gridley Single Spindle

BORING MACHINES

No. 2—3¼" Bar Rockford
No. 2—3⅛" Bar Rockford
No. 1 Barrett, 3¾" Bar
No. 2 Barrett, 4½" Bar
No. 2 Barrett, 5" bar, extension bed.

BORING MILLS

30" Bullard
42" Bullard
72" Bickford.

DRILLS

1, 2, 4 Spdl. Leland-Gifford.
No. 2-4 Spdl. Leland-Gifford, Motor Spindles. Power Feed
1, 2, 4 Spdl. Henry & Wright.
No. 314 Baker, 1 Spdl.
No. 2 Colburn, 4 Spindle.
No. 4—5 spdl. Foote-Burt.
No. 1 Baush Multiple
No. 3 Baush Multiple
3½' Cincinnati-Bickford Plain
6' Niles-Bement-Pond Universal
8' Western heavy.

GEAR CUTTERS

No. 2 Barber-Colman Hobber.
No. 12 Barber-Colman Hobber.
No. ½, Pfauter Hobber.
No. 2—36" Pfauter Hobber
No. 3-26" Brown & Sharpe.
No. 4-48" Brown & Sharpe.
No. 5-48" Brown & Sharpe
No. 6-72" Brown & Sharpe.
No. 6-A-72" Cincinnati.
96" Newton Spur Gear
Nos. 6, 61, 62 Fellows

GRINDERS

No. 70 Heald Internal
No. 2½ Universal (Bath type).
No. 4-12"x66" Landis Universal.
8" Arter Rotary Surface
No. 5 Springfield Planer Surface

MFG. LATHES

3½"x36" Fitchburg Lo-Swing.
3½"x60" Fitchburg Lo-Swing.
3½"x108" Fitchburg Lo-Swing.
8"x60" Fitchburg Lo-Swing.

ENGINE LATHES

18"x6' Bradford
18"x8' Lodae & Shipley.
21"x10' LeBlond
24"x12' American.
24"x13' Chard.
24"x16' Lodge & Shipley.
24"x18' Lodge & Shipley.
24"x22' Lodge & Shipley, Taper.
26"x8', 10' Bridgeford
30"x12' Whitcomb-Blaisdell
20"-40"x10' Rahn - Larmon Geared Head Sliding Bed Gap.
40"x12' Fifield

MILLERS

No. 3 Becker-Brainard Plain.
No. 4 Garvin Profiler
No. 5 Brown & Sharpe Vertical.
No. 4-B Becker Vertical
No. 5-B Becker Vertical.
No. 6 Becker Vertical.
24"x24"x12' Ingersoll Adj. Rail.
24"x20' Ingersoll Double Faced
36"x36"x12' Newton Duplex.
38"x44"x20' Ingersoll Slab.
72"x16"x14' Ingersoll Slab.
No. 1 Smalley-General Thread.

PLANERS

24"x24"x6' Powell.
24"x24"x6' Rockford.
24"x24"x6' Cincinnati, 2 heads.
24"x24"x12' Gray.
30"x30"x8' American.
30"x30"x8' Powell.
36"x36"x8', 18' Cincinnati.
36"x36"x12' American 2 hds.
42"x42"x12' Liberty
42"x42"x14' Gray, 2 heads.
48"x48"x10' Niles-Bement-Pond, 2 heads.
48"x48"x12' Gray, Reversing M.D.
60"x48"x20' Hamilton, 3 heads.
72"x60"x16' American, 4 heads.

PRESSES

No. 01 V.&O., M.D.
No. 1 V.&O., M.D.
No. 303 Bliss S.S., Geared.
No. 58 Toledo Nosing.
No. 178 Toledo Toggle Drawing

TURRET LATHES

16" Acme, Chasing Bar
18" Dreses Fox, Chasing Bar
2¼"x26" Greenlee
3¼"x40" Greenlee
3"x36" J. & L. 2 spdl.
18" Libby
21" Gisholt, 3¾" H.S.
24" Gisholt, 6¼" H.S.
24" Steinle, 6¼" H.S.
26" Libby, 7½" H. S., M.D.

MISCELLANEOUS

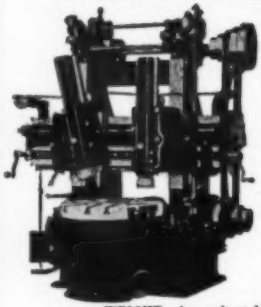
26" Springfield Shaper
24" Niles-Bement-Pond Slotter
No. 3-B J. N. La Pointe Broach
No. 4 LaPointe Broach
12" Bignall & Keeler Pipe Mach.

HILL-CLARKE MACHINERY CO.

645 W. WASHINGTON BOULEVARD, CHICAGO

42" BULLARD VERTICAL BORING AND TURNING MILL

Power rapid traverse, with two independent swivel heads



Capacity — 43" in diameter and 33½" in height. Tool Bars in both heads have a vertical movement of 30" and may be set at any angle up to 45 degrees either side of center. DRIVE — Single pulley constant speed motor drive.

WEIGHT—Approximately 14,000 lbs.

Your inquiries and list of surplus tools given prompt attention.

FRYE MACHINERY SALES CO.

549 West Randolph St., Chicago, Ill.

Phone Central 6443

TURRET LATHES

No. 5-A Potter & Johnston Auto.
No. 1-B Foster Universal.
3"x36" Jones & Lamson
10" 2-spindle, Jones & Lamson, Steel Head

MILLERS

No. 2 Cincinnati Hi-Power plain
No. 2 Brown & Sharpe Vertical
2" Pratt & Whitney Spline.

SHAPERS—PLANERS

24" Potter & Johnston
30" Morton Draw Cut Shaper

BORING MILLS

51" Bullard Vertical
2—72" Bickford Verticals
1—4" bar, Beaman & Smith Floor Type Horiz.

MISCELLANEOUS

No 1 Baker Keyseater
No. 1 Garvin, 2 Spdle. Profiler
No. 11 Pratt & Whitney Multiple Drill
No. B—16 Natco, Multiple, 34 Spdles.
No. 14 Colburn Drill
4 Spindle Leland-Gifford Drill
500# Bradley Hammer
8" Standard Pipe Machine, MD.
No. 4 Hilles & Jones Double Punch Shear
No. 6—72" Brown & Sharpe Gear Cutter
No. 4—48" Brown & Sharpe Gear Cutter
Nos. 1, 1B, 2 Campbell Nibblers
No. 21-SA Cochrane Bly Hi-Speed Saw
No. 178 Toledo Toggle Press

WIGGLESWORTH MACHINERY COMPANY

201 Bent St., Cambridge, Mass.

AUTOMATIC SCREW MACHINES

Cleveland	Mod.	Ser. No.	Drive
6—3¾"	A	34,000	B.D.
1—1¼"	A	28,000	B.D.
1—4¼"	A		B.D.
1—1¼"	B	34,000	B.D.
1—2"	B	33,000	M.D.
Gridleys			
1—1¾" 4 spdl.	G	3,000	B.D.
1—1¼" 4 spdl.	F	5,000	M.D.
1—1¼" 4 spdl.	G	10,000	M.D.
1— ⅞" 4 spdl.	G	8,600	M.D.
5—4¼" Single	Spdl.		B.D.

Brown & Sharpe

No. 2 Tur. Form, No. 00, 0 Cut Offs

LATHES

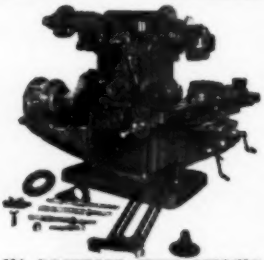
11"x4' So. Bend M.D. Fully Equipped
18"x6' Monarch Grd. Hd. M.D.
14"x8' Hendey Q.C. Taper Attach. M.D.

GRINDERS

No. 3 Wilmarth & Marmon Surf. Mag. Chk.
No. 2 Brown & Sharpe Univ. Cylinder, B.D.
No. 3 Ohio Univ. Equipment
Landis 10"x18" Plain M.D.
Covel 6"x18" Hand Surface Mag. Chk.M.D.

MILLING MACHINES

No. 2A Garvin Univ. Vert. Hd.
No. 2A Garvin Plain, Vise, M.D.
Cincinnati Plain 12"x30" Tbl. B.G.



No. 2½ ROCKFORD UNIV. MILLING MACHINE FULLY EQUIPPED

SHAPERS

24" Gould & Eberhardt, Vise M.D.
16" Gould & Eberhardt, Vise B.B.
20" Steptoe B.G. Vise C/s.

HAND SCREW MACHINES

No. 7 Foster Pwr. Fds. to cross slide & turret
No. 3 B & O Bar Fd. Pwr. to Turret
No. 3, 4, 5, Foster Pwr. to Turret
14" Gisholt Univ. M.D.

SCOTT MACHINERY SALES, INC.

1811 CARROLL AVE., CHICAGO, ILL., Phone Monroe 1690

Guaranteed

IMMEDIATE DELIVERY

NO. 2B HENRI HAUSER JIG BORER, MTR. DRIVE. FULLY EQUIPPED.

NO. 72 HEALD SIZEMATIC GRINDER, BELT DRIVE.

NO. 32 LUCAS "PRECISION" HORIZONTAL BORING, DRILLING AND MILLING MACHINE, 3-¾" DIAMETER SPINDLE MOTOR DRIVE WITH A. C. MOTOR. EQUIPPED WITH TURCHAN HYDRAULIC FOLLOWING ATTACHMENT.

DRILLS

4' Western Mfg. Type, Plain Radial, M. D.
No. 1&2 Leland-G. b., tap Att.
1 & 3 Sp. Allen, P. F. & T. A.
2 Spdle. Avey H .S. B. B.
No. ½ Avey Bench Drill.
1 & 2 Sp. Demco, H.S. B. B.
16" Superior, H. S., B. B.
20" Barnes all-grd. self-oiling.
24" Hoeffer Sldg. Hd. Tap. Att.
No. 13 Natco, 16 Spindles.
14"x10' Hendey Q. C. G., T. A.
16"x12' Hendey Q. C. G., T. A.
20"x8' Greaves Klusman Grd. Hd., Q. C. G.
24"x10' L. & S. Q. C. G, B. G.
24"x12' Schum. Boye q. c. g.

LATHES, TURRET

10"—2 Spdle. J. & L. Steel Hd., Covered Ways, M. D.
No. 3 Smurr & Kamen Hand.
No. 1 Foster Hand.
40" Gisholt Vert. Bor., arr. MD.
28" Cinc. Semi-Auto. Dupl. B.D.

PRESSES

No. 1 Bliss Cam, Fly & Grd.
Model "B" Rockford 1" Stroke, Floor Legs.

SHAPERS

20" Steptoe b. g. crank.
24" Steptoe B. G. Crank, SPD thru Gear Box.
24" Stock. b. g. crank, M. D.
25" S&M B.G. Crank, M.D. gr. b.

NO. 32 GIDDINGS & LEWIS BOR-DRIL-MIL. A.C., M. D., VERT. ADJ. OF HD. ON COL. 36". MAX. DIST. FACE OF SPDL. TO OUTBOARD SUPPORT 84½". LONG. TRAVEL OF TABLE, 50". W. S. OF TABLE 30"x54". 3½" BAR.

No. 2½ 28" W. F. & J. Barnes Sliding Head.
No. 22 Natco Multiple 24 Spindle Rect. Head, 13½"x31" area.

GRINDERS

No. 1 & 3 B&S Univ. Belt Drive.
No. 3 Cincinnati Universal.

LATHES

8"x18" Porter Cable, collets.
9"x4' Seneca Falls, Standard Change Gear, Back Geared.

MILLING MACHINES

No. 2V Reed Prentice Vert. MD.
No. 4 Becker Vertical, Back Gr.
No. 33 Kempsmith Plain, M. D. 13x67" Table.
6"x48" Pratt & Whitney Thread.
No. 1 Kempsmith Univ., B. G.
No. 1½ Garvin Universal.
No. 2A Becker Brainard Vert.
No. 3 Becker Vertical.
No. 1 U. S. Hand Miller.
No. 2 P & W Hand.

MISCELLANEOUS

Bolt Cut, 1" Landis Lead Scr.
Die Filer, No. 5 Thiel, m. d.
Gear Cut., No. 3—26"—B. & S.
Riv. Hmrs., 1½B, 2A, H. D., 3A, 3A H. D., & 5A High Speed.
Riv. Spin. ⅜" Linley, M. D.
Saw, 6x6 Peerless Hack.
Saw, No. 2 Marvel Draw Cut Hack.
Welder, 25 K. W. Acme.

George M. Bernstein & Co.

12 SO. CLINTON STREET — CHICAGO, ILLINOIS

— PARTIAL LIST —

36"x36"x10' Cincinnati Planer 4 heads, M. D.
12x52" Landis plain Grinders.
2¼"x26" Greenlee Flat turret lathe, cone.
No. 12 and No. 13 Natco Drills.
Avey 4 spindle, drill, No. 2 m. t.
Avey 6 spindle, drill, No. 2 m. t.
Single spindle Leland Gifford, B.B. drill.
No. 1B & No. 2B Edlund two spindle, B.B. drills.
No. 818 Dreis & Krump Hand Brake.
16" x 48" Landis Crankshaft grinders.
20" Kelly Shaper, B.G. Cone.
10' Robinson Toggle press brake.
3 Spindle Kern. B.B., drill with tapping heads.
24"x24"x6' Cincinnati planer, 1 head.
20"x10' Monarch lathe, q.c.g., cone.
No. 2X Garvin Tapping Machines.

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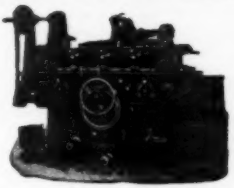

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1—No. 6 Diamond
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2—No. 18 Bryant
3—No. 6 Semi-Automatic Bryant
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1—No. 60 Heald
1—No. 65 Heald
1—No. 70 Heald
1—No. 72 Heald
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1—No. 23 Baxter & Whitney

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1—6"x18" Landis
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7—10"x24" Landis
2—10"x36" Norton
2—10"x48" Norton, Model A
2—10"x36" Norton, cam
1—14"x48" Norton, Type A
1—16"x32" Landis, crank pin

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5—No. 132 Arter Automatic

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1—No. 6 Gardner D. E.
3—No. 41-20" Besly D. E.
1—No. 84-16" Gardner D. E.
1—No. 26 Besly D. E.
1—No. 6 Besly D. E.
1—No. 50 Gardner S. E.
1—No. 51 Besly D. E.
1—No. 8 Badger S. E.
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2—No. 8DA Hisey Wolf D. E.
1—12" Gorton 6C S. E.
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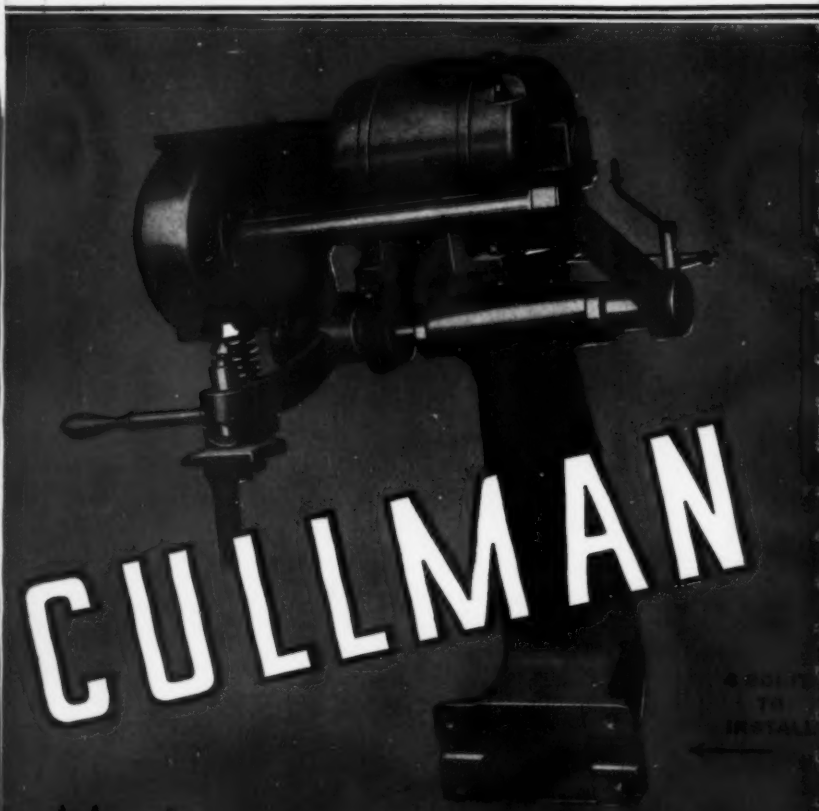

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